

SELECTED

SWATERRESOURCES ABSTRACTS



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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior



VOLUME 6, NUMBER 17 SEPTEMBER 1, 1973

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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Resources Research U.S. Department of the Interior Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

CHEMICAL INTERACTIONS OF ALUMINUM WITH AQUEOUS SILICA AT 25 DEGREES C, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02K. W73-10433

SODIUM AND MAGNESIUM SULFATE ION PAIRING: EVIDENCE FROM RAMAN SPEC-TROSCOPY, Rhode Island Univ., Kingston. Dept. of Chemis

try. F. P. Daly, C. W. Brown, and D. R. Kester. Journal of Physical Chemistry, Vol 76, No 24, p 3664-3668, 1972. 2 fig, 3 tab, 31 ref. OWRR B-036-

Descriptors: *Chemical analysis, *Aqueous solutions, *Spectroscopy, Electrolytes, Sodium, Magnesium, Sulfates, Hydrogen bonding, Ionization, Chemical reactions, Analytical techniques, Evaluation.

Raman spectra of aqueous solutions of sodium and magnesium sulfates were measured but failed to reveal any evidence of ion pairing. However, sulfate solutions with HCl added did exhibit relatively strong bands due to HSO4. Evidence for MgSO4 and NaSO4 ion pairs was obtained by the addition of sodium and magnesium salts to the latter solution; both cations compete with hydrogen ions for the SO4. This is clearly demonstrated in the Raman spectra by a decrease in intensity of the band assigned to HSO4 at 1,033 cm and an increase in intensity of the band assigned to SO4 at 982 cm in the solutions with sodium or magnesium added. (Woodard-USGS) Raman spectra of aqueous solutions of sodio nesium add W73-10650

02. WATER CYCLE

2A. General

SYNTHESIS AND EVALUATION OF URBAN-R-EGIONAL HYDROLOGIC RAINFALL-RUNOFF

Environmental Dynamics, Inc., Los Angeles, Calif.

Caur.
J. A. Dracup, T. J. Fogarty, and S. G. Grant.
Available from the National Technical Information Service as PB-220 965, \$3.00 in paper copy,
\$0.95 in microfiche. Completion Report, February
1973, 105 p. 9 fig, 5 tab, 48 ref, 2 append. OWRR
C-2182 (3407) (1).

Descriptors: "Rainfall-runoff relationships, "Hydrologic models, Waterbeds (Basins), Model studies, "Hydrologic cycle, Runoff, Rainfall, "Mathematical models, Data collections, Research and development, Regional analysis. Identifiers: "Urban watersheds, "Research appli-

Mathematical models of the hydrologic rainfall-runoff process are applied, evaluated and compared, using data from urban and natural watersheds. Criteria are developed for use in the selection of an appropriate hydrologic rainfall-runoff model for specific watershed needs. This study is oriented specifically at closing the gap between research and its application by practicing engineers and hydrologists in the water resources field. New models are not developed, but the use of existing models is clarified through a selection display tableau and user oriented computer programs implementing a wide range of rainfall-runoff models. W73-10416 W73-10416

THE INTERNATIONAL HYDROLOGICAL DECADE—A PRELIMINARY EVALUATION OF A COOPERATIVE EFFORT IN THE EARTH

A COOPERATIVE EFFORT IN THE EARTH SCIENCE PHELD,
L. A. Heindl.
In: Earth Science Aid to Developing Countries,
Second Symposium of the 24th International
Geological Congress, Montreal: International
Geological Congress, Ottawa, Canada, p 135-141,
1972. 6 ref.

Descriptors: *International Hydrologic Decade, *Reviews, *Hydrology, *Water resources development, Foreign countries, Programs, Evaluation, Conferences, Cooperatives, Organizations, Economics, Water demand, Water supply.
Identifiers: Developing countries, Earth sciences.

The International Hydrological Decade's central scientific effort is improving the scientific understanding of the world water balance. The decade program lists about 60 problem areas in which nations are encouraged to participate through national efforts and international cooperations and coordination. At the Mid-Decade Coordination which nations are encouraged to participate through national efforts and international cooperation and coordination. At the Mid-Decade Conference (December 1969) a majority of 75 nations represented, mostly developing countries, voted to concentrate the last five years of the Decade on practical aspects of hydrology of benefit to developing countries rather than to continue emphasis on scientific results—not that scientific programs were to be abandoned. Developing countries are not so much anti-science as they are for solving their growing practical problems. They favor those aspects of science with direct application in improving standards of living. They are satisfied to use advances made elsewhere or to gear their scientific programs to plug gaps in the research done elsewhere where this serves the national interest. The logical deductions seem to be that international scientific programs must be geared to the short- and long-term needs of the recipient country, rather than to the interest of the doner scientists, or of science per se. The development of a scientific capability in the natural resource field must be done within the framework of satisfying a developing country's practical and immediate needs. (Woodard-USGS) W73-10424

WATER BALANCE IN SOVIET CENTRAL ASISA (VODNYY BALANS TERRITORII SREDNEY AZII).

Nauchno-Issledovatelskii Sredneaziatskii eteorologicheskii Institut, (IISSR)

Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), Ivanov, Yu. N., editor, Leningrad, 1972. 104

Descriptors: "Water balance, "Precipitation (Atomospheric), "Runoff, "Evaporation, Transpiration, Temperature, Interception, Water loss, Water resources, Water quality, Soils, Soil moisture, Vegetation, Mountains, Lakes, Surfaces, Irrigation, Analytical techniques, Instrumentation, Measurement.

Identifiers: "USSR, "Soviet Central Asia, Inchies No USSR, "Soviet Central Asia,

Various items in the water balance of Soviet Central Asia are investigated in this collection of 10 papers published by the Central Asian Hydrometeorological Scientific Research Institute at Tashkent. The influence of mountain topogrammed, testibution of precipitation is examined, at Tashkent. The influence of mountain topog-raphy on distribution of precipitation is examined, and a method is proposed for determining the amount of rainfall that is intercepted by vegeta-tion. Studies are made of evaporation from free-water and soil surfaces, and water balances in large irrigatied areas of the Fergana Valley and Golodnaya steppe are compared. (See W73-10449 thru W73-10457) (Josefson-USGS)

SOME RESULTS AND WAYS OF DEVELOPING METHODS OF STREAMFLOW MEASURE-MENT IN MOUNTAIN COUNTRIES (NEKOTO-RYYE ITOGI I PUTI RAZVITIYA SPOSOBOV RASCHETA STOKA V USLOVIYAKH GOR-NYKH STRAN), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

For primary bibliographic entry see Field 07B. W73-10449

WATER RESOURCES OF MOUNTAIN LAKES IN SOVIET CENTRAL ASIA (VODNYYE RE-SURSY GORNYKH OZER SREDNEY AZII), Sredneziatskii Nauchno-issledovatelskii Gidrometeorologicheskii Institut, Tashkent For primary bibliographic entry see Field 02H. W73-10450

EFFECTS OF OROGRAPHY ON DISTRIBU-TION OF PRECIPITATION IN MOUNTAIN TION OF PRECIPITATION IN MUUNIAIR
BASINS (VLIYANIYE NEKOTORYKH ELEMENTOV OROGRAFII NA RASPREDELENIYE
OSADKOV V GORNYKH BASSEYNAKH),
Sredneziatskii Naucho-Issłedovatelskii
Gidrometeorologicheskii Institut, Tashkent (USSR). nary bibliographic entry see Field 02B. For primar W73-10451

COMPUTATION OF MONTHLY SOLID PRECIPITATION FROM TOTAL MONTHLY PRECIPITATION AND AVERAGE MONTHLY TEMPERATURE (RASCHET MESYACHNYKH SUMM TVERDYKH OSAD-KOV PO OBSHCHIM MESYACHNYM SUM-MAM OSADKOV I SREDNIM MESYACHNYM ZNACHENTYAM TEMPERAT URY VOZDUK-HA), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

INTERCEPTION OF PRECIPITATION BY VEGETATION AND ITS DETERMINATION IN WATER-BALANCE INVESTIGATIONS (PEREKHVAT ATMOSFERNYKH OSADKOV RASTITEL'NOST'YU I YEGO UCHET PRI VODNOBALANSOVYKH LEDOVANIYAKH), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

ary bibliographic entry see Field 02C.

(USSR). For primary bibliographic entry see Field 02B. W73-10453

EVAPORATION FROM FREE-WATER SUR-FACES IN SOVIET CENTRAL ASIA (ISPARENIYE A VODNOY POVERKHNOSTI V USLOVITAKH SREDNEY AZII), ziatskii Nauchno-Issledovatelskii eteorologicheskii Institut, Tashkent Sredneaziatskii (USSR). ary bibliographic entry see Field 02D. For primar W73-10454

SCHEME FOR MEASUREMENT OF EVAPORA-TION FROM SOIL SURFACES (SKHEMA RASCHETA ISPARENIYA S POVERKHNOSTI

ziatskii Nauchno-Issledovatelskii eteorologicheskii Institut, Tashkent (USSR). ry bibliographic entry see Field 02D. W73-10455

Group 2A-General

WATER BALANCE AND RUNOFF LOSSES IN THE FERGANA VALLEY AND GOLODNAYA STEPPE (STRUKTURA VODNOGO BALANSA I POTERI RECHNOGO STOKA V FERGANSKOV DOLINE I GOLODNOY STEPD, Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

Gdrometeorologicneski mstutu, Tushkent (USSR), F. E. Rubinova, and M. I. Getker. In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gdrometeorologicheskiy Institut Trudy, No 62 (77), p 84-90, Leningrad, 1972. 2 tab, 10 ref.

scriptors: *Water balance, *Water loss, *Runoff, *Evaporation, Transpiration, Return flow, Withdrawal, Irrigated land, Irrigation practices. Identifiers: USSR, *Fergana Valley, *Golodnaya

An analysis is made of water balance in two regions where irrigation is accomplished under substantially different natural conditions. In the Fergana Valley, the increase in runoff losses to evaporation on 100,000 ha of newly reclaimed land was 0.35 to km/yr, while in the Golodnaya steppe it was 0.86 cu km/yr. The total increase in runoff losses in the valley in 1935-65 (1.7 cu km/yr) was losses in the valley in 1935-65 (1.7 cu km/yr) was derived from increased transpiration (2.7 cu km/yr) and reduced direct evaporation from the soil (1.0 cu km/yr). In the Golodnaya steppe, transpiration and direct evaporation from the soil increased in the same period by 1.4 cu km/yr and 0.2 cu km/yr, respectively. In 1960-65, return flow in the valley was 46.5% of the water withdrawal, while in the steppe it was 23.5%. Expansion of irrigable land in both the valley and the steppe is expected to increase runoff losses by only 1.7 cu km/yr. (See also W73-10448) (Josefson-USGS) W73-10450.

SOME PROBLEMS IN THE WATER REGIMEN OF WEAKLY LEACHED CINNAMON-BROWN SOILS IN THE PARKENTSAY RIVER BASIN VOPROSY VODNOGO
KORICHNEVYKH
SLABOVYSHCHELOCHENNYKH POCHV BASSEYNA R. PARKENTSAY),
Sredneaziatskii Nauchno-Issledovatelskii
Gidrometeorologicheskii Institut.
Taskiii
(USSR).

For primary bibliographic entry see Field 02G. W73-10457

STOCHASTIC MODELS APPLIED TO OPERA-TION OF RESERVOIRS IN THE UPPER COLORADO RIVER BASIN IN TEXAS, Texas A and M Univ., College Station. Water Resources Inst.

G. L. Curry, G. E. O'Connor, R. A. Clark, and J.

Available from the National Technical Information Service as PB-221 025, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report 47, June 1973, 153 p, 21 fig, 16 tab, 78 ref. OWRR A-019-TEX (2). 14-31-0001-3844.

Descriptors: Weather modification, Optimization, *Reservoir operation, *Texas, Model studies, *Statistical models, *Simulation analysis, Precipitation (Atmospheric), *Meteorological

Identifiers: *Colorado River Basin (Tex), Concho River Basin (Tex), Linked reservoirs.

A hydrometeorological model (MOHS) is presented that utilized 30-day meteorological forecasts of temperature and precipitation issued every 15 days by the National Weather Service to provide an estimate of the futur hydrometeorological conditions of a river basis the future Use of the 30-day meteorological forecast categories of light, moderate, or heavy precipitation and below normal, near normal, or above normal temperature provide physical constraints upon quantum provides physical constraints upon quantum provide titative values which were synthesized by a Monte-Carlo simulation technique. Estimates of monthly precipitation for meteorological stations semi-randomly located within the river basin are simulated from the square-root-normal distribution, while monthly mean data of ambient-air temperature are simulated using the Gaussian distribution. The forecast periods of temperature provided information that verified better than chance, but precipitation periods did not verify well. Contingency tables of forecast versus observed weather and conditional probabilities for each forecast category and period obtained. Three reservoirs located in the Concho River Basin in West Texas were also modeled and tested in this study. (Runkles-Tex A and M)

THE APPLICATION OF A SIMPLE RAINFALL--RUNOFF MODEL TO A CATCHMENT WITH INCOMPLETE DATA COVERAGE, Swedish Meteorological and Hydrological Inst., Stockholm.

S. Bergstro

Sveriges Meteorologiska och Hydrologiska Institut, Notiser och preliminara rapporter, Serie Hydrologi, No 26, 1972. 25 p. 16 fig. 8 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Data processing, Data collections, Simulation analysis, Streamflow forecasting, Runoff forecasting, Identifiers: *Sweden.

A rainfall-runoff model was designed to yield reasonable results with few observed variables and with simple evaluation of parameters. Input is daily values of rainfall and monthly values of the potential evaporation. Output is daily values of discharge. Many well known physical processes are deliberately left out of the model as their con-stabilities. are deliberately left out of the model as their contribution to the complexity is not justified by the improvement of the results. Other processes are simplified and differ from the known reality in order to limit the number of parameters to optimize. The model can be used as a forecasting tool even in a poorly covered catchment. The simplicity of the model makes a rough parameter evaluation extremely easy and limits the demand of computer time. (Knapp-USGS) W73-10656

GEOHYDROLOGIC STUDY OF THE GORT LOWLAND AND ADJACENT AREAS OF WESTERN IRELAND USING ENVIRONMEN-

WESTERN IRELAND USING ENVIRONM TAL ISOTOPES, Ceylon Univ., Peradeniya. For primary bibliographic entry see Field 02F. W73-10660

STREAM BASEFLOW PREDICTION BY CON-VOLUTION OF ANTECEDENT RAINFALL EF-

FECTS, Pennsylvania State Univ., University Park, Dept. rennsylvania State Univ., University Park. Dept. of Civil Engineering. G. Aron, and J. Borrelli. Water Resources Bulletin, Vol 9, No 2, p 360-365, April 1973. 6 ref.

Descriptors: *Base flow, *Mathematical models, *Synthetic hydrology, Low flow, Simulation anal-ysis, Surface-groundwater relationships, Stream-flow forecasting, Antecedent precipitation.

drain theory and convolution is based on a parallel drain theory and convolution techniques. The infiltrating portions of saveral mineral process. trating portions of several rain events are superimposed on the groundwater reserves and allowed to drain to the stream as individual baseflow responses. The convolution technique sums the contribu-tions from each rain event to the stream to give the total baseflow at any point in time. A single lumped parameter from a parallel drain analogy represents the physical characteristics of a watershed. This parameter determines the time delay between a rainfall event and the resulting baseflow response. The procedure was applied to data from five watersheds. A 1-year data collection was used to find the best-fitting runoff delay coefficient, thus calibrating the response function which was subsequently applied to 2 test years to predict a dry-weather low-flow sequence. The agreement between predicted and observed flows was reasonably good, but marred by frequent minor rainfalls during the chosen dry periods. The application of the method should be much more successful in the western states where prolonged successful in the western states where prolonged dry periods are common. (Knapp-USGS) W73-10675

SHELF SEDIMENT TRANSPORT: A PROBA-

SHELF SEDIMENT TRANSPORT: A PROBA-BILITY MODEL, National Oceanic and Atmospheric Administra-tion, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. For primary bibliographic entry see Field 02J. W73-10735

HYDROLOGY AND WATER RESOURCES IN ARIZONA AND THE SOUTHWEST, VOLUME

Proceedings of the 1972 Meetings of the Arizona Section-American Water Resources Association and the Hydrology Section-Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona. (1972).

Descriptors: *Hydrology, *Water resources, *Publication, *Arizona, *Southwest US, Arid lands, Research and development, Hydrologic cyiands, Research and development, Hydrologic cy-cle, Groundwater, Snowpacks, Information retrieval, Water management (Applied), Stream-flow, Water quality, Water pollution, Weather modification, Water quality control, Nitrogen cy-cles, Decision making, Data transmission, Flood forecasting, Rainfall, Ephemeral streams. Identifiers: Collective utility.

Presented are 28 papers by 42 university professors, government scientists, consultants, and graduate students interested in arid lands hydrology and water resources as applied to Arizona and the Southwest. The collection represents a review of the status of hydrologic research interests in this region. Topics include Colorado River trips, hydrology as a science, snowpack relationships, information systems, management attitudes, information systems, was a science, snowpack relationships, information systems, was a science, groundwater contamination, transmissivity distribution, seepage control, evaporation, legal aspects of urban runoff, watershed management to increase streamflow, weather modification, water pollution, collective utility, grass and soil filtration of runoff, nitrogen transformations of sewage effluent, turfgrass-soil system filters, stochastic decision models, data analysis, small sample bias in flood estimation, rainfall probability models, antecedent soil moisture relations, transition probabilities of monthly flow, flood routing models for ephemeral channels, bed material characteristics and transmission losses in ephemeral streams, and water disposition in ephemeral channels. (See W73-10846) (Popkin-Arizona) hydrology as a science, snowpack relations 10846) (Popkin-Arizona) W73-10818

HYDROLOGIC MODELING, PARAMETER ESTIMATION, AND WATERSHED CHARAC-TERISTICS.

Georgia Inst. of Tech., Atlanta. L. D. James.

L. D. James. Journal of Hydrology, Vol 17, No 4, p 283-307, December 1972. 4 fig, 4 tab, 18 ref. OWRR C-1282

Descriptors: *Mathematical models, *Rainfall-ru-noff relationships, *Computer programs, *Urban

hydrology, Streamflow forecasting, Water yield, Simulation analysis, Water balance, Hydrologic budget, Urbanization. Identifiers: *Stanford Watershed Model.

A general watershed model represents the runoff phase of the hydrologic cycle by a series of moisture accounting equations. The Stanford Watershed Model uses fixed equations containing variable parameters which are calibrated for a watershed by trial-and-error matching of simulated to recorded flows. Opset, a self-calibrating watershed model, was developed to estimate these parameters through a computerized least squares matching. The procedure reduces estimating scatter and provides parameter estimates which may be correlated with physical characteristics of the watershed and with watershed changes with urbanization. (Knapp-USGS)

NONLINEAR EQUATION OF UNSTEADY GROUNDWATER FLOW, California Univ., Santa Barbara. Dept. of Mechanical Engineering. For primary bibliographic entry see Field 02F. W73-10965

2B. Precipitation

PEATMOS PROBABILITY OF PRECIPITATION FORECASTS AS AN AID IN PREDICTING PRECIPITATION AMOUNTS, National Weather Service, Garden City, N.Y.

Eastern Region.

S. E. Wasserman.

S. E. Wasserman. Available from NTIS, Springfield, Va. 22151 as COM-73-10243 Price \$3.00 printed copy; \$0.95 microfiche. National Oceanic and Atmospheric Administration Technical Memorandum NWS ER-50, December 1972. 12 p, 6 tab, 4 ref.

Descriptors: *Precipitation (Atmospheric), *Forecasting, *Precipitation intensity, *Probable maximum precipitation, Mathematical studies, Precipitation gages, Data collections, Equations, Analytical techniques, United States, Geographical regions.
Identifiers: *Precipitation amounts forecasting,
Eastern United States.

The National Weather Service has developed a method of using Primitive Equation and Trajecto-ry Model Output Statistics (PEATMOS) for deterry Model Output Statistics (PEATMOS) for determining the probability of precipitation (PoP) equal to or exceeding 0.01 inch in specified 12-hour periods. In this study the frequency of occurrence of 12-hour precipitation amounts exceeding other specified quantities in addition to 0.01 inch is determined as a function of the PEATMOS PoP. Data were collected for 13 different cities in the eastern United States. The 13 cities were chosen solely on the availability of data in a form suitable for computer processing. Single, city results are solely on the availability of data in a form suitable for computer processing. Single city results are preferable to results for grouped cities, but the limited amount of data available for each city required that the data be pooled. The cities were grouped according to similarity of PEATMOS PoP equations. Stations in groups I and 2 have identical PEATMOS PoP equations but were separated further according to geographic location. Group I represents the Northeast and group 2 represents the Southeast United States. The data are tabulated. (Woodard-USGS) W73-10426

WATER BALANCE IN SOVIET CENTRAL ASISA (VODNYY BALANS TERRITORII SREDNEY AZII). Nauchno-Issledovatelskii Sredneaziatskii Gidrometeorologicheskii Institut, (USSR). ary bibliographic entry see Field 02A.

EFFECTS OF OROGRAPHY ON DISTRIBUTION OF PRECIPITATION IN MOUNTAIN BASINS (VLIYANIYE NEKOTORYKH ELEMENTOV OROGRAFII NA RASPREDELENIYE OSADKOV V GORNYKH BASSEVNAKH), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

(USSR). M. I. Getker, G. Ye. Glazyrin, and Yu. N.

M. I. Getker, G. 1902.
Yemel'yanov.
In: Vodnyy balans territorii Sredney Azii;
Sredneziatskiy Nauchno-Issledovatel;skiy
Gidrometeorologicheskiy Institut Trudy, No 62
(77), p 30-38, Leningrad, 1972. 3 fig. 3 tab, 10 ref.

Descriptors: *Precipitation (Atmospheric), *Rainfall disposition, *Orography, *Mountains, *River basins, Valleys, Slopes, Elevation, Correlation basins, Valleys, S analysis. Identifiers: USSR.

For exposed, favorably oriented valleys, the coefficients of correlation of monthly and annual precipitation with distance from the divides defining the valleys are larger than these for sheedprecipitation with distance from the divides defining the valleys are larger than those for absolute elevation. An analysis of residual coefficients of correlation of precipitation with distance, when the effects of absolute elevation are removed, shows the importance of considering these indices in precipitation estimates. For October-May, when most of the annual precipitation occurs, the residual coefficients of correlation vary between 0.40 and 0.90 for the Surkhandar'ya, Akhangaran, and Talas River valleys. (See also W73-10448) (Josefson-USGS) W73-10451

COMPUTATION OF MONTHLY SOLID PRECIPITATION FROM TOTAL MONTHLY PRECIPITATION AND AVERAGE MONTHLY AIR TEMPERATURE (RASCHET MESYACHNYKH SUMM TVERDYKH OSAD-KOV PO OBSHCHIM MESYACHNYM SUMAM OSADKOV I SREDNIM MESYACHNYM ZNACHENIYAM TEMPERAT URY VOZDUK-HA) HA), Sredneaziatskii

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

For primary bibliographic entry see Field 02C. W73-10452

INTERCEPTION OF PRECIPITATION BY VEGETATION AND ITS DETERMINATION IN WATER-BALANCE INVESTIGATIONS (PEREKHVAT ATMOSFERNYKH OSADKOV RASTITEL'NOST'YU I YEGO UCHET VODNOBALANSOVYKH

Sredneaziatskii Gidrometeorologicheskii Nauchno-Issledovatelskii ii Institut, Tashkent (IISSR)

(USSN).
L. N. Poberezhskiy, and G. N. Trofimov.
In: Vodnyy balans territorii Sredney Azii;
Sredneaziatskiy Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 62
(77), p 46-53, Leningrad, 1972. 1 fig, 2 tab, 16 ref.

Descriptors: *Precipitation (Atmospheric), *Interception, *Vegetation, Vegetation effects, Soil surfaces, Wetting, Water loss, Rainfall intensity, Wind velocity, Trees, Grasses, Shrubs, On-site investigations, Equations, Hydrographs. Identifiers: USSR, *Uzbekistan, Nomograms.

Field experiments were conducted in Uzbekistan to determine maximum depth of wetting of trees, grasses, and shrubs. Rainfall intensity and duration and wind velocity had no effect on the amount of precipitation losses by interception were computed for a wheat field in the Samarkand Oblast and for different species of vegetation in the Parkentsay River basin. (See also W73-10448) (Josef-son-USGS) W73-10453

STOCHASTIC MODELS APPLIED TO OPERA-TION OF RESERVOIRS IN THE UP COLORADO RIVER BASIN IN TEXAS, Texas A and M Univ., College Station. W Resources Inst. For primary bibliographic entry see Field 02A. W73-10365

DISCONTINUITY IN EARLY MORNING EVAPORATION, Calgary Univ., Alberta. Dept. of Geography. For primary bibliographic entry see Field 02D. W73-10672

DEVELOPMENT OF DESIGN STORM HYETO-DEVELOPMENT OF DESIGN STORM HYETO-GRAPHS FOR CINCINNATI, OHIO, Cincinnati Univ., Ohio. Dept. of Civil and En-viroamental Engineering. H. C. Preul, and C. N. Papadakis. Water Resources Bulletin, Vol 9, No 2, p 291-300, April 1973. 4 fig, 4 tab, 7 ref. EPA-WQ Research Grant 11024 DQU.

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Pyetographs, *Design storm, *Ohio, Urban runoff, Storm runoff, Urban drainage, Mathematical models, Model studies, Simulation analysis, Depth-area-duration analysis. Identifiers: *Cincinnati (Ohio).

A synthetic storm rainfall hyetograph for a one-year design frequency was derived from the one-year design frequency was derived from the one-year intensity-duration curve for Cincinnati, Ohio. Detailed rainfall data for a 3-year period were collected from three rain gages in the Bloody Run Sewer Watershed, an urban drainage area of 2,380 acres. The synthetic storm pattern is obtained from an analysis of the antecedent precipitation immediately preceding the maximum period of three selected durations. Only rains which produced excessive runoff were considered. The same approach can be used for other design frequencies. The purpose of this study is to provide synthetic storm hyetographs to be used as input in deterministic mathematical models simulating urban storm water runoff for the design, analysis, and possible surcharge prediction of sewer systems. (Knapp-USGS)

DISTRIBUTION OF MORE IMPORTANT COM-PLEX BIOMETEOROLOGICAL INDICES OVER THE GLOBE,

M. Gregorczuk. Ekol Pol. Vol 19, No 45, p 745-787. 1971. Illus. Identifiers: *Distribution patterns (Temperature), Indices, *Meteorological data, Pressure, Tempera-

On the basis of data on air temperature, water vapor pressure, wind velocity, and solar radiztion, calculation is presented on the spatial distribution of more important complex biometeorological indices over the globe; dry and wet cooling power calculated according to Siple and Hill's formulae, 3 varieties of effective temperatures, and the index of thermal effect of solar radiation. The spatial distribution of more important components of wet cooling and effective temperatures are also presented—Copyright 1973, Biological Abstracts, Inc. W73-10816

HYDROLOGY AND WATER RESOURCES IN ARIZONA AND THE SOUTHWEST, VOLUME For primary bibliographic entry see Field 02A.

THE CONSTRUCTION OF A PROBABILITY DISTRIBUTION FOR RAINFALL ON A WATERSHED BY SIMULATION, Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.

Group 2B—Precipitation

G. Williamson, and D. R. Davis.

G. Williamson, and D. R. Davis.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assan., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 369-383. (1972). 4 fig, 1 tab, 6 ref. OWRR C-3259 (3708) (2).

Descriptors: *Probability, *Distribution patterns, *Rainfall, *Simulation analysis, *Model studies, Watersheds (Basins), Rain gages, Storms, Densi-

The relations between a rain gage reading and its location, the storm location and height, and the areal rain on the watershed are considered in an effort to determine a probability distribution for the areal rainfall on the watershed, given the rain gage reading at a point. When the number of rain gages on or near a watershed is small, the estimate of areal rainfall may be in considerable error, especially if the rainfall event is a thunderstorm. A rain gane reading may be viewed as a sample, since the cashy if the rauntal event is a thunderstorm. A rain gage reading may be viewed as a sample, since the amount of areal rainfall on a watershed can vary between extremely wide limits while the point rainfall over a single gage remains constant. The model described here attempts to simulate the in-teraction among variables of rain gage readings and location, and storm location, by choosing a random location, and storm location, by choosing a m location and height for a storm from son probability density function; determine the rain gage reading given the distance from gage to storm center; and determine the average rainfall on the watershed. Results demonstrate that a rainfall waverance. Results demonstrate that a rainfall model may be broken into segments and implemented by computer to develop probability density functions for areal rainfall, given the rain gage reading and storm location. The criteria of minimum expected variance are then be used to minimum expected variance can then be used to find the optimum gage location. (See also W73-10818) (Paylore-Arizona)

2C. Snow, Ice, and Frost

GUIDE TO WORLD INVENTORY OF SEA. LAKE AND RIVER ICE.

UNESCO-IASH Contribution to International Hydrological Decade: UNESCO Technical Papers in Hydrology, No 9, 1972. 23 p, 3 fig, 2 tab, 25 ref.

Descriptors: "Ice cover, "Surface waters, "Ice-water interfaces, Measurement, Methodology, Depth, Volume, Iced lakes, Rivers, Sea ice, Inter-national Hydrological Decade. Identifiers: "Ice inventory methods.

The only technique recommended in this guide for measuring ice thickness on bodies of water is measuring ice thickness on bodies of water is direct measurement through a hole in the ice cover. One possible exception is a probe developed by the Defence Research Board of Canada (Houle, 1961). It consists of a long plastic tube through the wall in which sealed bare wire electrodes are spaced I cm apart. Each electrode has a separate lead to the top end of the tube. The tube is filled with a resin whose thermal conductivity about matches that of ice. The tube is for tivity about matches that of ice. The tube is frozen into the ice cover at the beginning of the season in a vertical position with the top projecting. A measurement consists of observing the resistance between successive pairs of electrodes until a significant change in resistance occurs. The ice-water interface is thus located within interface is thus located within an accuracy of about I cm. This device works well in freshwater, but has proved unsuitable in seawater. Also described are methods of measuring the areal extent and volume of ice over bodies of water. (Woodard-USGS) SNOW STUDIES USING THERMAL INFRARED MEASUREMENTS FROM EARTH SATEL-

ental Research and Technology, Inc.,

Environmental Research and Technology, Inc., Lexington, Mass.
J. C. Barnes, and C. J. Bowley.
Available from NTIS, Springfield, Va. 22151 as COM-72 11424 Price 33.00 printed copy; \$0.95 microfiche. Allied Research Associates, Inc, Final Contract Report 8(92-F, July 1972. 112 p, 17 fig, 14 tab, 17 ref. NOAA-ESS Contract 1-35350.

Descriptors: "Remote sensing, "Snow survey, "Snowmelt, "Runoff forecasting, "Water yield, Snow, Infrared radiation, Satellites (Artificial), Calibrations, Instrumentation, Temperature, Sur-veys, Mapping.

Satellite thermal infrared measurements were studied for mapping snow cover using Nimbus and ITOS imagery and digitized data. The measurements were correlated with snow distributions mapped from satellite photographs and snow reports for both relatively flat terrain and mountains and the statement of the United States Thomas IP. tainous areas of the United States. Thermal IR measurements can be a useful tool for mapping snow-cover extent, particularly in relatively flat snow-over extent, particularly in relatively has terrain. In IR imagery, snow-covered areas are usually depicted by significantly brighter tones (lower temperatures) than the surrounding snow-free terrain. Digitized data show that areas with tower temperatures) than the surrounding snow-free terrain. Digitized data show that areas with snow cover have IR temperatures, on the average, 5 to 10 deg K lower than areas with no snow. The spatial resolution of existing radiometers is mar-ginal for mapping snow with the accuracy desired for many hydrologic applications, and in moun-tainous areas IR temperature measurements are influenced by terrain elevation regardless of the snow distribution. Also, IR temperatures mea-sured over snow during the spring months can be considerably higher than the value that would be expected for a melting snow surface. Calibration problems alone cannot account for the apparent discrepancy. The relatively high IR temperatures are believed to be primarily the result of the radiometer viewing warmer surfaces, such as trees or bare rock, in addition to the melting snow field. (Knapp-USGS) (Knapp-USGS) W73-10435

COMPUTATION OF MONTHLY SOLID PRECIPITATION FROM TOTAL MONTHLY PRECIPITATION AND AVERAGE MONTHLY TEMPERATURE AIR (RASCHET MESYACHNYKH SUMM TVERDYKH OSAD-KOV PO OBSHCHIM MESYACHNYM SUM-MAM OSADKOV I SREDNIM MESYACHNYM ZNACHENIYAM TEMPERAT URY VOZDUK-Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

M. I. Getker, G. Ye. Glazyrin, and Yu. N.

M. I. Getter, G. 7e. Giazyrin, and Yu. N. Yemel'yanov. In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Isaledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 39-45, Leningrad, 1972. 2 fig, 1 ref.

Descriptors: *Snow, *Precipitation (Atmospheic), *Air temperature, *Monthly, *Averag Precipitation gages, Probability, Equation *Average, Curves. Identifiers: USSR.

A probability method for computing monthly solid precipitation was based on total monthly precipitation measured by a precipitation gage and average monthly air temperature at the gaging site. The method was tested for six meteorological stations at different elevations and under different conditions. The results of computations were satisfactory, (See also W73-10448) (Josefson-USGS)

INTERNAL FRICTION OF SINGLE-CRYSTAL ICE, Regions Research and Engineering Lab., Regions Avenue Hanover, N.H. J. P. Van Devender, and K. Itagaki. J. P. Van Devender, and K. Itagaki. Research Report 243, March 1973. 39 p, 12 fig, 2

Descriptors: *Ice, *Crystals, *Friction, Analytical techniques, Irradiation, Temperature, Data collections, Correlation analysis, Curves, Plastic defor-

Identifiers: Single-crystal ice, Internal friction, Scratching.

The internal friction of single-crystal ice was investigated for the amplitude-independent regime and the results interpreted in terms of the prevailing theories. The study was motivated by a combination of questions raised by other experimenters. Their results were correlated with the results ters. Their results were correlated with the results of these experiment to advance understanding of internal friction in dielectrics (most internal friction studies have been on metals) and the peculiar relationship between dielectric and mechanical relaxation in ice. The two theories for internal friction in ice were also tested. In addition, the effects of mechanical straining and X-irradiation on damping were studied to reveal the loss mechanism. The effects observed on the internal friction of pure, single-crystal ice, in the flexure mode of oscillation between 400 and 1400 Hz, supersted the existence of a dislocation-controlled protect of usculation between 400 and 1400 Hz, sup-ported the existence of a dislocation-controlled mechanism, with the drag produced by the interac-tion of the dislocation with the protons in the crystal. (Woodard-USGS)

PREDICTING DEGREE DAY SNOW MELT FACTORS WITH CROWN CLOSURE IN ARIZONA PONDEROSA PINE, Arizona Univ., Tucson. Dept. of Watershed ary bibliographic entry see Field 02E.

ABLATION ON GLACIERS IN SOVIET CEN-TRAL ASIA (ABLYATSIYA LEDNIKOV SREDNEY AZII), Nauchno-Issledovatelskii ii Institut, Tashkent Sredneaziatskii ? Gidrometeorologicheskii (USSR). V. G. Konovalov.

V. O. Rohovanov. Sredneaziatskiy Regional'nyy Nauchno-Iss-ledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 8 (89), Leningrad, 1972. 159 p.

Descriptors: "Glaciers, "Ablation, Melting, Ice, Snow, Snowmelt, Evaporation, Heat balance, Heat flow, Temperature, Climatology, Radiation, Cloud cover, Runoff, Glacial drift, Mountains, Elevation, Regulation, Measurement, Equations. Identifiers: USSR, "Soviet Central Asia, Heat exchange, Glacier tongues, Bowe

Measurement of heat balance on the surface of glaciers in Soviet Central Asia during the ablation season is described. Intensity and duration of ablation on glaciers are examined, and a method is developed for making computations from laboratory analyses to determine losses in heat sustained by ablation. An analysis is made of the correlation between ablation and air temperature and of the problem of artificial regulation of mountain glacier runoff. (Josefson-USGS)

SNOWPACK INVENTORY PREDICTION RELATIONSHIPS, Arizona Univ., Tucson. Dept. of Watershed Management. AN ANALYSIS OF YEARLY DIFFERENCES IN P. F. Ffolliott, D. B. Thorud, and R. W. Enz.

Evaporation and Transpiration—Group 2D

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p. 31-42, (1972). 3 fig., 2 tab, 7 ref. OWRR A-029-ARIZ (6).

Descriptors: "Analysis, "Snow cover, "Forest watersheds, "Vegetation effects, "Water yield, Rainfall-runoff relationships, Pondero-a pine trees, Regression analysis, Statistical methods, Moisture content, Seasonal, Snow surveys, Arizona, "Snowpack.

Inventory-prediction relationships between snow-pack conditions and forest attributes may be useful in estimating water yields derived from snow, but such relationships are developed usually from source data collected over a short time period. Analyses of long-term data suggest inventory-prediction relationships developed from limited data may have more general application, however. Available records from 18 snow courses in the ponderosa pine type in Arizona provided source data in this study, which was designed to empirically analyze inventory-prediction relationships developed from long-term Snow Survey records. The primary hypothesis tested in the study, and evaluated by statistically analyzing the family of regression equations representing a snow course, regression equations representing a snow course, was that, given a precipitation input, the distribution of snowpack water equivalent at peak seasonal accumulation is determined by the spatial seasonal accumulation is determined by the spatial arrangement of the forest cover, e.g. basal area. Generally 12 of the 18 snow courses evaluated appeared to support the hypothesis, three courses did not, and three courses were considered inconclusive. (See also W73-10818) (White-Arizona) W73-10821

A SEARCH: NEW TECHNOLOGY FOR PAVE-MENT SNOW AND ICE CONTROL, Abt Associates, Inc., Cambridge, Mass. For primary bibliographic entry see Field 05G. W73-10883

BIOLOGICAL PRODUCTIVITY OF LAKES KRIVOE AND KRUGLOE,
Akademiya Nauk SSSR, Lening
Zoologicheskii Instut.
For primary bibliographic entry see Field 05C.
W73-10896

THE CHAR LAKE PROJECT. A STUDY OF ENERGY FLOW IN A HIGH ARCTIC LAKE, Toronto Univ. (Ontario). Dept. of Zoology. For primary bibliographic entry see Field 05C. W73-10904

STRUCTURE OF A MULTI-YEAR PRESSURE RIDGE, Cold Regions Research and Engineering Lab., A. Kovacs, W. F. Weeks, S. Ackley, and W. D. Hibler, III. Arctic, Vol 26, No 1, p 22-31, March 1973. 9 fig, 12

Descriptors: *Sea ice, *Ice cover, *Navigation, *Ice, Arctic, Profiles.
Identifiers: *Pressure ridges.

Three traverse profiles were measured across a large pressure ridge in the Beaufort Sea. The ridge sail extended 4 m above sea level and the ridge sail extended 4 m above sea level and the ridge keel 13 m below. The cross-sections of the ridge keel can be described as roughly semicircular. This suggests that form drag coefficients for flow trans-verse to the long axes of multiyear ridges may be as high as 0.8. Much of the ice in the ridge has a very low salinity and is quite strong. All the inter-block voids that initially existed in the ridge at the time of formation have been completely filled with ice. Multiyear ridges are significant obstacles to even the largest icebreaking ship and should be avoided if possible. A very large first-year ridge with a sail height of 12.8 m is also described. This is the largest free floating sides were recommended. is the largest free-floating ridge yet measured. (K-napp-USGS) W73-10974

FIELD EXPERIMENTS ON FREEZING AND THAWING AT 3.399 METERS IN THE ROCKY MOUNTAINS OF COLORADO, U.S.A., Universidad Nacional del Sur, Bahia Blanca (Ar-

gentina).
A. E. Corte, and A. O. Poulin.
In: Research Methods in Pleistocene Geomorphology; Proceedings of 2nd Symposium on Geomorphology, Summer 1971, Guelph, Ontario, Canada: Guelph University Publication, p 1-25, 1972.

Descriptors: *Freezing, *Thawing, *Frost action, *Alpine, *Mapping, Permafrost, *Colorado, Frost heaving, Frozen ground, Soil water, On-site tests, On-site data collections, Photogrammetry, *Rocky

In the Rocky Mountains of Colorado above 3.300 meters (over the timber line) some large sorted features are similar to those of the polar regions. Similar sorted features are found at the bottom of shallow lakes well below the timber line. These features were studied to find whether they are acreatures were student to into whether they are ac-tive or inactive and related to permafrost of the last glacial event. A field experiment was started in 1959 and controlled every year until 1966 by means of stereophotographs. Three soil types were selected for the test: a clean sandy gravel; a well graded sandy gravel; and a very dirty sand gravel. A small reservoir was built to provide water for saturating the soil. Measurements of surface mo-tions were made photogrammetrically. The area without fines did not develop horizontal sorting. without tines did not develop horizontal sorting. The surface in 1966 was coarser than in 1960. The areas with 7% and 18% fines showed circular depressions in 1960 and 1962 produced by animal tracks or by collapse. Sorting into these depressions occurred for a year after their appearance and then ceased. (Knapp-USGS) W73-10976

COMPARISON OF FLAME AND FLAMELESS ATOMIC ABSORPTION FOR THE DETER-MINATION OF CALCIUM, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 02K. For primary bibliographic entry see Field 02K. W73-11037

2D. Evaporation and Transpiration

FREQUENCY ANALYSES OF THE RATIO OF ACTUAL TO POTENTIAL EVAPOTRANSPIRA-TION FOR THE STUDY OF CLIMATE AND VEGETATION RELATIONSHIPS,

VEGETATION RELATIONSHIPS, Louisians State Univ., New Orleans. R. A. Muller. Proceedings of the Association of American Geog-raphers, Vol 3, p 118-122, 1971. 1 fig. 1 tab, 10 ref.

Descriptors: "Evapotranspiration, "Water balance, "Soil-water-plant relationships, "Cli-mates, Vegetation, Frequency analysis, Analytical techniques, Model studies, Computer programs, Environmental effects, Correlation analysis, Hydrologic cycle. Identifiers: "Actual evapotranspiration, "Potential

The application of frequency analyses is described for Thornthwaite water balance components instead of average climatic data for environmental studies. The spatial representativeness of water

balance data and the relation of the index of moisture to average climatic data are considered. Monthly, seasonal, and annual frequency analyses of the ratio of actual to potential evapotranspiration (AE/PE) are introduced by four examples for comparative regional studies of relationships between climate and vegetation. These examples of AE/PE ratios are presented with the intention of encouraging further interest in the relationships among frequencies of hydroclimatic components of the water balance models and environmental consequences. The water balance models are simplified descriptions of the very complex hydrologic cycle. Yet the simple models can provide hypothetical continental systems to which real world phenomena can be compared. (Woodard-USGS) IISUS! W73-10421

ANALYSIS OF WATER CONSUMPTION OF VARIOUS GRAPE CULTIVARS, Levi Eshkol School of Agriculture, Jerusalem

Icardo, S. Lavee, and R. M. Samish.
Viis. Vol 10, No 4, p 279-291, 1972. Illus.
Identifiers: Gasometric methods, *Grape cultiven,
Gravimetric methods, *Transpiration, Vitisvinifera, *Water utilization.

The efficiency of water use (transpiration ratio) was investigated in various cultivars of grape (Vitis vinifera) by gravimetric and gasometric methods. Results of gravimetric and gasometric methods. Results of gravimetric measurements showed positive correlation between water use efficiency and vigor. Regression lines of the transpiration ratio on the final dry weight differed significantly in their curves and their distance from the coordinate axes. Statistical analysis showed that the quantitative effect of vigor on the water use efficiency was smaller in the cv. 'Muscat Hamburg' than in 'Sultanina' and 'Queen of the Vineyards.' Covariance analysis showed that 'Sultanina' was a less efficient water user than 'Queen of the Vineyards' for plants with the same vigor. Gasometric methods revealed no significant differences between the cultivars, probably due to the climination of interference and boundary layer resistance effect.—Copyright 1973, Biological Abstracts, Inc. stracts. Inc.

EVAPORATION FROM FREE-WATER SUR-FACES IN SOVIET CENTRAL ASIA (ISPARENTYE A VODNOY POVERKHNOSTI V USLOVIYAKH SREDNEY AZII), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

Tashkent

USSR).
V.N. Reyzvikh, and A. B. Popova.
In: Vodnyy balans territorii Sredney Azii;
Sredneaziatskiy Nauchno-Isaledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 62
(77), p 57-74, Leningrad, 1972. 4 fig, 8 tab. 9 ref.

Descriptors: *Evaporation, *Surfaces, *Measur ment, *Evaporation pans, Temperature, Vap pressure, Humidity, Wind velocity, Elevatio Equations. Identifiers: USSR, *Soviet Central Asia.

Measurement of evaporation from free-water surfaces in Soviet Central Asia is currently based on use of eight 20-sq-m-circular tanks, 52 GGI-3,000 land pans, and 9 GGI-3,000 floating pans. Fifty-six percent of the instruments are located in lowland regions, 21.1% in the piedmont zone, and only 7.3% in areas at altitudes above 2,000 m. Observational periods range from 11 to 15 years for 31% of all evaporation stations, from 6 to 10 years for 40% of the stations, and are less then 5 years for the remaining 29% of the stations. Emipirical equations presently used to estimate evaporation from free-water surfaces are analyzed, and a regional formula is developed to measure evaporation from water areas in Soviet Central Asia. (See also W73-10448) (Josefson-USGS)

Group 2D—Evaporation and Transpiration

SCHEME FOR MEASUREMENT OF EVAPORA-TION FROM SOIL SURFACES (SKHEMA RASCHETA ISPARENIYA S POVEREHNOSTI

POCHVY), Sredneaziatskii Gidrometeorolo ziatskii Nauchno-Issledovatelskii eteorologicheskii Institut, Tashkent

Grammeteorologicneszn institut, lasnkent (USSR). A. I. Sergeyev. In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 62 (77), p 75-83, Leningrad, 1972. 1 fig, 7 ref.

Descriptors: "Measurement, "Evaporation, "Soil surfaces, Air-earth interfaces, Air-water interfaces, Temperature, Vapor pressure, Boundary processes, Equations. Identifiers: USSR.

A mathematical scheme for measurement of evaporation is based on solution of a stationary problem for the soil-air system at equilibrium soil-moisture distribution. Equations are derived for calculating temperature distribution and vapor density by soil depth and for determining temperature and vapor pressure at the soil surface. Formulas derived for temperature and vapor pressure are based on data obtained from a network of meteorological stations. (See also W73-10448) (Josefson-USGS) W73-10450.

DISCONTINUITY IN EARLY MORNING

EVAPORATION, Calgary Univ., Alberta. Dept. of Geography. L. C. Nkemdirim, and P. F. Haley. Water Resources Bulletin, Vol 9, No 2, p 376-380, April 1973. 1 fig. 1 tab.

Descriptors: *Evaporation, *Meteorology, Humidity, Weather, *Canada, Winds, Solar radiation, Air-earth interfaces, Boundary processes. Identifiers: *Calgary (Alberta).

Identifiers: *Calgary (Alberta).

A sudden jump was found in evaporation at Calgary, Canada from zero shortly after sunrise to a peak about an hour later and an equally dramatic return to zero occurred in another hour before proceeding in its normal course through the day. The most important atmospheric features involved were the presence at the one to two meter level during the early hours of either superadiabatic conditions or strong inversion conditions. The lapse condition usually followed after a night of strong inversion at this layer and corresponds to the initial surface heating shortly after sunrise. The requirements for sudden jumps in early morning evaporation seemed to be: sufficient soil moisture to maintain evaporation at or near the potential rate during the preceding day; low windspeed; and isothermal or inversion profile in the lower air layer followed by an abrupt change in the temperature profile to lapse condition shortly after sunrise, convectional activity, saturation of the lower air layer, and return to neutral or inversion profile. (Knapp-USGS)

DETERMINATION OF EVAPORATION OF WATER FROM ARID LOESS SOILS DURING NIGHTLY TEMPERATURE INVERSION PHASE BY TRITIUM-LABELING OF PREDETERMINED SOIL LAYERS, W. Kuehn, M. Elimdust, and M. Evenari. Kerntechnik. Vol 14, No 2, p 56-60. 1972. Illus. In German Jac.

German also.

Identifiers: Arid lands, *Evaporation, Layers,
*Loess soils, Soil layers, Soils, Temperature inversion, Tritium, *Soil moisture.

The loss of moisture is limited to the first few cen-timeters nearest the surface. Owing to temperature inversions, there must be diffusion of water vapor

from soil layers at a depth of about 40 cm towards the surface, but this vapor probably condenses in the cooler layers higher up.—Copyright 1973, Biological Abstracts, Inc. W73-10602

COLOR IT EVAPORATION, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

M. J. Dvoracek.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 153-167, (1972). 7 fig. 1 tab, 5 ref.

Descriptors: *Evaporation, *Hydrologic properties, *Color, *Sewage, *Runoff, Radiation, Adsorption, Air temperatures, Texas, Arid lands.

Evaporation is a major hydrologic process in arid and semiarid lands. A brief review of evaporation and semiarid lands. A brief review of evaporation literature indicates that a unique parameter, color, is desirable. Artificially colored water was used in a west Texas experiment to monitor evaporation rate and to note the effect of color on evaporation rate than sewage and runoff. Five different colored waters were studied from 1966 to 1970. Color seems to affect the amount of adsorbed radiation as well as the extent of black radiation. The trend for a higher daily rate of evaporation existed for colored waters except during periods of low air temperature. Seven graphs are presented to support these conclusions. (See also W73-10818) (Popkin-Arizona)

COMPUTING EVAPOTRANSPIRATION BY GEOSTROPHIC DRAG CONCEPT, Cornell Univ., Ithaca, N.Y. Dept. of Civil and En-vironmental Engineering. J. A. Mawdsley, and W. Brutsaert. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9483, p. 99-110, January 1973. 4 fig, 3 tab, 27 ref, append. OWRR A-036-NY (1).

Descriptors: *Evapotranspiration, *Evaporation, *Air-earth interfaces, *Drag, Hydrodynamics, Humidity, Temperature, Mass transfer, Diffusion, Boundary layers, Turbulent boundary layers, Boundary processes, Shear drag, Identifiers: *Geostrophic wind, *Geostrophic

A procedure is given for computing regional evapotranspiration. The assumptions underlying the model are essentially those used in the one-dimensional mass-transfer methods, but the shear stress is determined by means of the density of the air, the geostrophic drag coefficient, and the surface geostrophic drag coefficient, and the surface geostrophic wind. The main advantage of the method is that all data needed in the computation (the surface temperature, the pressure of the air, the specific humidity at two levels in the atmospheric boundary layer, and the surface geostrophic wind speed) can be obtained from standard meteorological data. Generally, good agreement was obtained between mean monthly evapotranspiration computed for a number of stations and the corresponding evaporation data obtained from Class-A pans. (Knapp-USGS) W73-10970

2E. Streamflow and Runoff

A FINITE ELEMENT SOLUTION FOR TWO--DIMENSIONAL DENSITY STRATIFIED FLOW, Water Resources Engineers, Inc., Walnut Creek,

For primary bibliographic entry see Field 02H. W73-10418

NONLINEAR STABILITY OF PLANE POISEUILLE PLOW OF VISCOELASTIC LIQUIDS, Delaware Univ., Newark. Dept. of Chemical En-

gineering.
K. C. Porteus, and M. M. Denn.
Transactions of the Society of Rheology, Vol 16,
No 2, p 309-319, 1972. 7 fig, 11 ref. OWRR A-009DEL (6).

Descriptors: *Rheology, *Critical flow, *Laminar flow, *Turbulent flow, Reynolds number, Viscosity. Identifiers: Viscoelastic fluids

The stability of plane Poiseuille flow to finite disturbances was studied for the second order fluid using the cascade method. The analysis was carried out for elasticity numbers up to 0.0001. In this range the Deborah number based upon disturbance propagation is small and the use of a second order fluid model is consistent. In contrast to linear theory in this region, elasticity has a stabilizing effect on finite disturbances relative to the Newtonian liquid, and the difference between stability behavior of Newtonian and slightly elastic liquids tends to disappear. (Knapp-USGS)

TIDAL CURRENT ASYMMETRIES OVER THE NORFOLK SANDBANKS, Cambridge Univ., (England). Dept. of Applied Mathematics and Theoretical Physics. J. M. Huthnance.

Estuarine and Coastal Marine Science, Vol 1, No 1, p 89-99, January 1973. 3 fig, 2 tab, 8 ref.

Descriptors: "Tides, "Currents (Water), "Shoals, "Waves (Water), "Coriolis force, Sand waves, Sand bars, Water circulation, Topography, Tidal waters, Mathematical models.

Identifiers: "Norfolk Sandbanks (England).

A model for oscillatory tidal flow over parallel topography suggests that the Coriolis force and bottom drag are each responsible for distinct mechanisms of mean-current generation. A clockwise mean-current circulation was predicted and confirmed by data collected at the Norfolk Sandbanks, England. (Knapp-USGS) W73-10430

THE SIGNIFICANCE OF WAVE PARAMETERS IN THE SORTING OF BEACH PEBBLES, Unit of Coastal Sedimentation, Taunton (En-

gland). For primary W73-10431 nary bibliographic entry see Field 02J.

RUNOFF CHARACTERISTICS OF CALIFOR-NIA STREAMS, Geological Survey, Washington, D.C. S. E. Rantz.

S. E. Rantz. For sale by GPO, Washington, D.C. 20402, Price \$0.70. Geological Survey Water-Supply Paper 2009-A, 1972. 38 p., 4 fig, 1 plate, 4 tab, 3 ref.

Descriptors: "Runoff, "California, "Variability, "Rainfall-runoff relationships, Snowmelt, Base flow, Altitude, Snowpacks, Streamflow, Stream-flow forecasting, Precipitation (Atmospheric), Water balance, Rainfall.

California streams exhibit a wide range of runoff characteristics related to the climatologic, topographic, and geologic characteristics of the basins they drain. The runoff characteristics are identified by numerical index values. They are related to mean annual precipitation, altitude, latitude, and location. Streamflow is generally ephemeral if the mean annual precipitation is less

Streamflow and Runoff—Group 2E

than 10 inches, intermittent if the mean annual precipitation is between 10 and 40 inches, and perennial if the mean annual precipitation is more than 40 inches. Latitude and altitude determine the proportion of the winter precipitation that will be stored for subsequent runoff in the late spring and dummer. In general, if a watershed has at least 30% of its area above the normal altitude of the anowine on April 1, it will have significant snowmelt runoff. If the sum of the August and September runoff exceeds 3.0% of the annual runoff, hase flow is well sustained. If the percentage is less than 1.5, base flow is poorly sustained. The distribution of daily flow is skewed for all streams, but it is more skewed for streams whose flow is predominantly storm runoff than for streams that carry large quantities of base flow. The variability of storm-runoff streams is greater than that of anownelt streams, and the lowest values of variability are associated with streams that carry large quantities of base flow. (Knapp-USGS) W73-10447

WATER BALANCE IN SOVIET CENTRAL
ASISA (VODNYY BALANS TERRITORII
SREDNEY AZII).
Sredneaziatskii Nauchno-Isaledovatelskii
(USSR).

Nauchno-Isaledovatelskii
(USSR).

ry bibliographic entry see Field 02A.

SOME RESULTS AND WAYS OF DEVELOPING METHODS OF STREAMFLOW MEASURE-MENT IN MOUNTAIN COUNTRIES (NEKOTO-RYYE ITOGI I PUTI RAZVITIYA SPOSOBOV RASCHETA STOKA V USLOVIYAKH GORNYKH STRAN), Sredneziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

aziatskii Nauchno-Issledovatelskii eteorologicheskii Institut, Tashkent (USSR).

ary bibliographic entry see Field 07B.

WATER BALANCE AND RUNOFF LOSSES IN THE FERGANA VALLEY AND GOLODNAYA STEFFE (STRUKTURA VODNOGO BALANSA I POTERI RECENOGO STOKA V FERGANSKOV DOLINE I GOLODNOV STEPI), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

For primary bibliographic entry see Field 02A. W73-10456

EFFECTS OF URBANIZATION OF SEDIMEN-TATION AND FLOODFLOWS IN COLMA CREEK BASIN, CALIFORNIA, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 04C. 1973.1045.

FLOODS IN NEW YORK-1969, FLOUDES IN NEW YORK—1999, Geological Survey, Albany, N.Y. F. L. Robison. New York State Department of Environmental Conservation Report of Investigation RI-13, 1973. 33 p, 14 fig, 2 tab.

Descriptors: "Floods, "Flood damage, "Flood peak, "New York, "Flood data, Streamflow, Hydrologic data, Rainfall-runoff relationships, Gaging stations, Flood frequency, Flood flow. Identifiers: "New York State floods (1969).

Intense rainfall in southeastern New York, July 27-28, 1969, produced high flows on streams in Sullivan and neighboring counties. Precipitation of 3.18 to 9.20 inches was reported. Total damage to streets, highways, homes, and business places in

Sullivan County was estimated to exceed \$2 million. The county was declared a disaster area. Peak flows on several streams ranged in frequency of occurrence between 40 and 200 years. Very heavy rains in central New York and the southwestern Adirondacks on May 18-20 totaled 3.5 to 6.5 inches. The recorded peak discharge of 11,300 cfs at the Black River at Boonville gaging station on May 20 was the second highest in 58 years of record. Because a large part of the area affected by this storm is rural, most of the damage was done to highways, bridges, and farmland. On June 23 a cloudburst dropped nearly 6 inches of rain on the village of McGraw in Cortland County. Peak discharges for the Smith and Trout Brooks have recurrence intervals greater than 50 years. Total damage in the village was estimated at \$500,000. (Woodard-USGS)

RAYLEIGH-RITZ AND GALERKIN FINITE ELEMENTS FOR DIFFUSION-CONVECTION PROBLEMS, Manchester Univ. (England). Simon Engineering

For primary bibliographic entry see Field 02F. W73-10670

THE WATER RESOURCES PROGRAMS OF THE U.S. GEOLOGICAL SURVEY, Geological Survey, Washington, D.C. W. A. Radlinski.

er Resources Bulletin, Vol 9, No 2, p 366-371,

Descriptors: "Water resources, "Research and development, "Data collections, "Investigations, "Federal government, Mapping, Surveys, Water resources development, Water quality, Groundwater, Surface waters, Hydrology, Hydrogeology. Identifiers: "U.S. Geological Survey.

Identifiers: *U.S. Geological Survey.

The water resources programs of the U.S. Geological Survey are unique among Federal agencies; the Survey does not operate or manage water facilities, but provides facts that are used by other organizations. This separation of fact finding from action programs assures information free from bias. USGS operates 18,000 surface water stations. Water levels are measured at 28,000 observation wells. An urban hydrology program provides data such as rainfall, runoff, and water quality for use in the management of storm runoff land-use planning, housing development, and highway construction. Estuarine and coastal water studies are underway. A flood-hazard mapping program shows areas subject to inundation. Groundwater recharge investigations determine the extent that groundwater storage can be used to supplement storage in surface reservoirs. A subsurface waste-storage program develops information on formations used for waste storage. The Gulf Coast Hydroscience Center greatly increases capability for research and development. The National Water Data Exchange is designed to improve communications between collectors and users. (Knapp-USGS)

STREAM BASEFLOW PREDICTION BY CON-VOLUTION OF ANTECEDENT RAINFALL EF-

FECTS,
Pennsylvania State Univ., University Park. Dept.
of Civil Engineering. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-10675

EFFECTS OF TIME STEP SIZE IN IMPLICIT DYNAMIC ROUTING, National Weather Service, Silver Spring, Md. Of-

National Weather Server, fice of Hydrology. D. L. Fread. Water Resources Bulletin, Vol 9, No 2, p 338-351, 4 1072 & fig. 30 ref.

Descriptors: "Routing, "Finite element analysis, "Unsteady flow, Numerical analysis, Mathemati-cal models, Equations, Open channel flow, Mathe-matical studies.

Identifiers: *Dynamic routing.

The effects of the size of the time step used in the integration of the implicit difference equations of unsteady open-channel flow were determined for typical hydrographs with durations in the order of days or weeks. Truncation errors related to the size of the time step cause a numerical distortion (dispersion and attenuation) of the computed transient. The magnitude of the distortion is related directly to the size of the time step, the length of channel reach, and the channel resistance, and inversely to the time of rise of the hydrograph. The type of finite difference expression which replaces spatial derivatives and non-derivative terms in the partial differential equations of unsteady flow has an important influence on the magnitude of the numerical distortion, as well as the numerical stability of the implicit difference equations. Time step sizes in the range of 3 to 6 hrs generally tend to minimize the combination of required computation time and numerical distortion of transients having a time of rise of the order of several days. (Knapp-USGS)

AN ON-SITE HYDROLOGIC DATA RECORD-ING SYSTEM, Utah Water Research Lab, Logan. For primary bibliographic entry see Field 07B. W73-10677

PRECISE WATER VELOCITY MEASURE-MENTS USING PHOTOGRAMMETRIC MENTS USING PHOTOGRAMMETRIC TECHNIQUES, Wisconsin Univ., Madison. Dept. of Civil and En-vironmental Engineering. For primary bibliographic entry see Field 05B.

HYDROLOGICAL STUDIES OF THE UPPER PARAGUAY RIVER BASIN (PANTANAL RE-GION, MATO GROSSO STATE, BRAZIL), United Nations Educational, Scientific and Cul-tural Organization, New York. Div. of Natural Resources Research. L. Lisoni, and E. Stretta. Nature and Resources, Vol 9, No 1, p 10-13, January-March 1973.

Descriptors: Water resources development, *Hydrology, *Flood plains, *South America, Planning, Programs, Data collections, Model stu-dies, Computer models, Flood control, Flood forecasting, Streamflow, River basins, Project purposes. Identifiers: *Paraguay River basin (Brazil), United Nations Development Program.

Nations Development Program.

Fifteen hundred kilometers west of the Atlantic coast, along the boundary between Brazil, Bolivia, and Paraguay, lies a most unusual region of the South American continent, the Pantanal zone, which consists of a huge flood plain, 50,000 square kilometers with a river basin some 400,000 square kilometers, adjoining that of the Amazon and Parana Rivers. The Paraguay River and its tributaries traverse this region at an altitude between 50 and 140 meters. In some years, streams and lagoons merge in the rainy season to form a huge sheet of water which flows slowly towards Asuncion (Paraguay) and the Rio de la Plata, moving the Parana. The purpose of the project, approved by the United Nations Development Program, is to set up a hydrometeorological network in the Upper Paraguay Basin and to conduct surveys to investigate the hydraulic system of the Pantanal; at the same time environmental studies will be carried out, and an attempt will be made to establish a flood forecasting system based on an experimental model. (Woodard-USGS)

Group 2E—Streamflow and Runoff

W73-10682

PREDICTING DEGREE DAY SNOW MELT FACTORS WITH CROWN CLOSURE IN ARIZONA PONDEROSA PINE, Arizona Univ., Tucson. Dept. of Watershed P. L. Jackson.

M.S. Thesis, 1972. 51 p, 11 fig, 6 tab, 44 ref. OWRR-A-029-ARIZ(1).

Descriptors: "Forecasting, "Snowmelt, "Canopy, "Ponderosa Pine, "Snow management, "Arizona, Limiting factors, Southwest U.S., Water demand, Water supply, Water harvesting, Model studies, "Respression, analysis," At teams Regression analysis, Air temperature, Equations, Rainfall-runoff relationships.

Identifiers: *Crown closure.

Water is a major factor limiting man's econom and social development in the arid regions of the Southwest. Increased water demand in Arizona causes evaluation of possibilities for increasing causes evaluation of possibilities for increasing surface runoff from high elevation snow accumulation areas. Snow-melt indices based on air temperatures were evaluated using Arizona ponderosa overstory crown closure as an inventory prepersons were evaluated unit and an inventory pre-diction variable by regression analysis. Degree day snowmelt factors were dependent variables and percent crown closure was the independent variapercent crown closure was the independent variable. Median air temperature was non-significant. Maximum air temperature was significant, though it explained only 12 percent of the variation in snowmelt. The regression equation does not appear adequate for snowmelt prediction in field situations. Crown closure did not appear to be an adequate predictor of median or maximum temperature degree day snow melt factors in Arizona ponderosa pine. (Popkin-Arizona) W73-10697

INFLUENCE OF SURFACE AND NEAR-SU-REACE CALICHE DISTRIBUTION ON INFIL-TRATION CHARACTERISTICS AND FLOOD-ING, LAS VEGAS AREA, NEVADA, Nevada Univ., Reno. Center for Water Resources

R. L. Cooley, G. W. Fiero, Jr., L. H. Lattman, and

R. L. Cooley, G. W. Fiero, Jr., L. H. Lattman, and A. L. Mindling. Available from the National Technical Informa-tion Service as PB-221 121, 33.00 in paper copy, 30.95 in microfiche. Project Report No. 21, February 1973, 41 p., 33 fig, 2 tab, 17 ref, append. OWRR B-055-NEV (1), 14-31-0001-3613.

Descriptors: *Caliche, *Infiltration, *Flash floods, Urban drainage, *Nevada, Floods, *Flood con-trol, Runoff, Precipitation (Atmospheric), Impoundments.
Identifiers: *Las Vegas (Nev.), *Red Rock Canyon Fan (Nev.).

The study was conducted on the Red Rock The study was conducted on the Red Rock Canyon fan which is a large alluvial fan bordering the Las Vegas basin on the east flank of the Spring Mountains. The objectives were (1) to determine the types, degrees of development, and distribu-tion of calcium carbonate deposition on the Red Rock Canyon fan as these affect infiltration and runoff; (2) to investigate the engineering projects designed for flood control in the urban area in reladesigned for flood control in the urban area in relation to the expected runoff; (3) to obtain geomorphic and hydrologic information essential to the selection of alternative sites for artificial recharge and flood impoundments; and (4) to coordinate the study with local agencies currently planning flood control projects. Because adequate precipitation and runoff data were not available and could not be collected during the short term of the project, the study was concentrated upon the potential for the factors studied to influence runoff. (Schulke-Nevada) SHELF SEDIMENT TRANSPORT: PROCESS AND PATTERN. For primary bibliographic entry see Field 02J. W73-10746

AN INTRODUCTION TO OCEANIC WATER MOTIONS AND THEIR RELATION TO SEDI-MENT TRANSPORT, Army Coastal Engineering Research Center, Washington, D.C. For primary bibliographic entry see Field 02J. W73-10747

WAVE BOUNDARY LAYERS AND THEIR RELATION TO SEDIMENT TRANSPORT, Army Coastal Engineering Research Center, Washington, D.C. For primary bibliographic entry see Field 02J. W73-10748

EXPERIMENTS ON BOTTOM SEDIMENT MOVEMENT BY BREAKING INTERNAL WAVES, Massachu

setts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences. For primary bibliographic entry see Field 02J. W73-10750

SEDIMENT TRANSPORT ON THE CONTINENTAL SHELF OFF OF WASHINGTON AND OREGON IN LIGHT OF RECENT CURRENT MEASUREMENTS, Washington Univ., Seattle. Dept. of Oceanog-For primary bibliographic entry see Field 02J. W73-10753

IMPLICATIONS OF SEDIMENT DISPERSAL FROM LONG-TERM, BOTTOM-CURRENT MEASUREMENTS ON THE CONTINENTAL SHELF OF WASHINGTON, Washington Univ., Seattle. Dept. of Oceanog-raphy. For primary bibliographic entry see Field 02J. W73-10754

SUSPENDED SEDIMENTS IN CONTINENTAL SHELF WATERS OFF CAPE HATTERAS, NORTH CAROLINA, Illianis Univ., Chicago. Dept. of Geology. For primary bibliographic entry see Field 02J. W73-10758

IMPLICATIONS OF SEDIMENT DISPERSAL FROM BOTTOM CURRENT MEASUREMENTS; SOME SPECIFIC PROBLEMS IN UN-DERSTANDING BOTTOM SEDIMENT DIS-TRIBUTION AND DISPERSAL ON THE CON-TINENTAL SHELF-A DISCUSSION OF TWO

PAPERS, National Oceanic and Atmospheric Administra-tion, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. For primary bibliographic entry see Field 02J. W73-10763

OBSERVATIONS AND SIGNIFICANCE OF DEEP-WATER OSCILLATORY RIPPLE MARKS ON THE OREGON CONTINENTAL Oregon State Univ., Corvallis. School of Oceanog. nary bibliographic entry see Field 02J.

A SOLUTION TO SMALL SAMPLE BIAS IN FLOOD ESTIMATION, Arizona Univ., Tucson. Dept. of Systems and In-

W. Metler.

In: Hydrology and Water Resources in Arizon and the Southwest, Vol 2, Proceedings of the 197 in: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 351-368, (1972). 3 ref.

Descriptors: *Flood forecasting, *Sampling, *Algorithms, *Design criteria, Statistical models, Culverts, Bridges, Regression analysis, Equations, History, Stream gages, Average flow, Peak discharge, Regional flood, Regional development, Missouri.

To design culverts and bridges that will pass cer-tain design floods, computations of the estimates of such floods must be specified. Regression anal-ysis is one method of predicting design floods for construction sites. Determination of such predic-tions depends on the regression coefficients, which is two depends on estimates of the floods. which in turn depend on estimates of the floods computed from historical records. The computa-tion of the historical estimate that must serve as input to the regression analysis is discussed. input to the regression analysis is discussed.

Regression predictions based on inputs computed from the number of standard normal deviates from the mean introduce a bias into the estimate, however, because of the small sample size commonly encountered in streamflow estimation. The predictions will be refere to the standard between the standard products and the standard products and the standard products and the standard products are standard products. encountered in streamflow estimation. The predictions will, therefore, always be less than regression predictions based on the so-called t-estimate which will provide a more realistic prediction. Equations demonstrate the applicability of this theory. Demonstration sites chosen are in the plains region of Missouri, restricted to those areas of less than 30 sq. miles, where historical records were provided by the USGS. (See also W73-10818) (Paylore-Arizona) (Paylore-Arizona) W73-10840

OBJECTIVE AND SUBJECTIVE ANALYSIS OF TRANSITION PROBABILITIES OF MONTHLY FLOW ON AN EPHEMERAL STREAM, Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
W. Dvoranchik, L. Duckstein, and C. C. Kisiel.
In: Hydrology and Water Resources in Arizona
and the Southwest, Vol 2, Proceedings of the 1972

meetings of the American Water Resources Assn., Arizona Section, and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 407-437. 1972. 6 tab, 2 fig, 7

Descriptors: *Analysis, *Probability, *Monthly, *Ephemeral streams, *Statistical methods, Watershed management, Stochastic processes, Daily hydrographs, Streamflow forecasting, Model studies, Digital computers, Simulation analysis, Regulation, Arizona, Arid lands.

ysis, Regulation, Arizona, Ard lands.

A critique of statistical properties of monthly flows on an ephemeral stream in Arizona is given. A subjective procedure, justified for managerial purposes not concerned with the variability of flow within the month, is proposed for sequential generation of monthly flow data. Ephemeral flows should be modeled by starting with at least historical daily flows for more meaningful monthly flow models. Stochastic properties of monthly streamflows and state transition probabilities are reviewed with regard to ephemeral streams. A flow chart for a streamflow model geared to digital computers, with a simulation of streamflow subroutine, is developed. Meaningful monthly flow models could serve as a check on alternative models (subjective matrix, lag-one auto regressive, harmonic, bivariate normal, bivariate log-normal models). Rules and guidelines are presented in developing meaningful probability matrices. (See also W73-10818) (Popkin-Arizona) W73-10843

A PROPOSED MODEL FOR FLOOD ROUTING IN ABSTRACTING EPHEMERAL CHANNELS, Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.

Southwest Watershed Research Center.

L. J. Lane.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section-Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 439-453. (1972). 3 fig. 1 tab, 23

Descriptors: "Model studies, "Flood routing, "Flood forecasting, "Ephemeral streams, "Rainfall disposition, Rainfall-runoff relationships, Watershed management, Range management, Thunderstorms, Rainfall, Streamflow, Vegetation, Groundwater recharge, Bank storage, Rates, Storage, Arizona

Almost all runoff from semiarid rangeland watersheds in southern Arizona results from intense highly variable thunderstorm rainfall. Abstractions, or transmission losses, are important in diminishing streamflow, supporting riparian vegetation and providing natural groundwater recharge. A flood routing procedure is developed using data from the Walnut Gulch Experimental Watershed, where flood movement and transmission losses are represented by a system using storage in the channel reach as a state variable which determines loss rates. Abstractions are computed as a cascade of general components in linear form. Wide variation in the parameters of this linear model with increasing inflow indicates that a linear relation between losses and storage is probably incorrect for ephemeral channels. (See also W73-10818) (Popkin-Arizona)

BED MATERIAL CHARACTERISTICS AND TRANSMISSION LOSSES IN AN EPHEMERAL STREAM,

STREAM,
Agricultural Research Service, Tucson. Southwest
Watershed Research Center.
J. B. Murphey, L. J. Lane, and M. H. Diskin.
In: Hydrology and Water Resources in Arizona
and the Southwest, Vol 2, Proceedings of the 1972
meetings of the Arizona Section, American Water
Resources Assn., and the Hydrology Section,
Arizona Academy of Science, May 5-6, 1972,
Prescott, Arizona, p 455-472. (1972). 2 tab, 3 fig, 8
ref.

Descriptors: *Bed load, *Channel morphology, *Ephemeral streams, *Streamflow, *Thunderstorms, Coawcetion, Storms, Limiting factors, Geology, Geomorphology, Volume, Porosity, Specific yield, Alluvium, Absorption, Cross sections, Correlation analysis, Arizona, Arid lands. Identifiers: Transmission losses.

An average of 6 to 13 streamflows from intense summer convective storms occurs annually in the Walaut Gulch Experimental Station, 58 square miles in southeastern Arizona. Flows last generally less than 6 hours, and the channels are dry 99 percent of the time. The limiting factors imposed by the geology and geomorphology of the channel to transmission losses of a 6 square mile channel in the Station are described. The Precambriam to Quaternary geology is outlined, and geomorphology of the channels are described. Volume, porosity and specific yield of alluvium with a mean specific yield of 28 percent, and a maximum water absorbing capacity of 29 acre-feet or 7 acre-feet per mile of reach. Channel slope is insensitive to changes in geological material beneath it or to changes in flow regime. Channel cross section is highly sensitive to geology and flow regime. Transmission losses were highly correlated to volume of inflow. (See also W73-10818) (Popkin-Arizona) An average of 6 to 13 streamflows from intense

WATER DISPOSITION IN EPHEMERAL STREAM CHANNELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
T. W. Sammis.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 473-491, (1972). 5 fig, 3 tab, 15 ref.

Descriptors: "Rainfall disposition, "Ephemeral streams, "Groundwater recharge, "Infiltration, "Evapotranspiration, Equations, Porecasting, Vegetation, Channels, Climates, Evaporation, Instrumentation, Infiltrometers, Simulation analysis, Soil structure, Field capacity, Arizona, Arid lands, Riparian plants. Identifiers: Transmission losses, Philip's equation.

Identifiers: Transmission losses, Philip's equation. The contribution of flows from small watersheds to groundwater recharge is of interest. Water disposition depends on infiltration and evaporation characteristics. This study had the objective of developing an infiltration equation for estimating transmission losses during a flow event in an ephemeral stream near Tucson, Arizona, in the Rocky Mountain Forest and Range Experiment Station. Palo verde, desert hackberry, cholla, marmontea and mesquite are the major bank species of the sandy channels. A climatic section consisting of a hydrothermograph recording rain gage and class A evaporation pan was installed. A water balance method was used to estimate evapotranspiration. A specially designed infiltrometer was used to immute flow events. The data allowed the following conclusions: Philip's infiltration equation is an excellent mathematical model, initial moisture affects initial infiltration rate, the Philip coefficients are determinable by the infiltrometer constructed, soil moisture affects infiltration rates, and transpiration rates diminish linearly proportional to the ratio of available water to field capacity. (See also W73-10818) (Popkin-Arizona) W73-10846

INFORMATION CONTENT OF TIME-VARIANT

Nevada Univ., Reno. Dept. of Civil Engineering. For primary bibliographic entry see Field 07C. W73-10969

MAXIMUM BREAKER HEIGHT, Army Coastal Engineering Research Center, Washington, D.C. For primary bibliographic entry see Field 08B. W73-10975

CHARACTERISTICS OF WAVE RECORDS IN CHARACTERISTICS OF WAVE RECORDS IN THE COASTAL ZONE, Army Coastal Engineering Research Center, Washington, D.C. For primary bibliographic entry see Field 08B. W73-10979

FLOOD PLAIN INFORMATION—MEADOW CREEK, EAGLE RIVER, ALASKA. Army Engineer District, Anchorage, Alaska. For primary bibliographic entry see Field 04A. W73-10981

RECONNAISSANCE OF THE MANISTEE RIVER, A COLD-WATER RIVER IN THE NORTHWESTERN PART OF MICHIGAN'S SOUTHERN PENINSULA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-10985

FREE-SURFACE IDEAL FLUID FLOWS BY FINTTE ELEMENTS, Cornell Univ., Ithaca, N.Y. Dept. of Civil EnFor primary bibliographic entry see Field 08B. W73-10988

COMPARISON OF BRIDGE BACKWATER

COMPARISON OF BRIDGE BACKWATER RELATIONS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
G. V. Skogerboe, J. W. H. Barrett, W. R. Walker, and L. H. Austin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9799, p 921-938, June 1973. 14 fig, 8 ref, append. AID Contract csd-2460.

Descriptors: "Backwater, "Flow profiles, "Equations, "Bridges, Non-uniform flow, Open channe flow, Subcritical flow, Stage-discharge relations. Identifiers: "Submerged flow.

Identifiers: "Submerged flow.

Flow conditions at a proposed bridge site on an open channel may be either uniform or non-miform, depending on channel conditions. The effect of the constriction on the water surface profile, both upstream and downstream, is conveniently measured with respect to the normal water surface in the absence of the constriction under the original flow conditions. Irrespective of the original flow conditions existing at the bridge site, by using a combination of the momentum and continuity equations a general submerged flow equation may be obtained for the open-channel constriction. By making two simplifying assumptions and manipulating the remaining variables, this equation may be expressed in the form of a submerged flow equation. The equations may be plotted on the coordinates used for submerged flow analysis, with head loss as the abscissa, discharge as the ordinate, and a series of parallel straight lines of slope 3/2 representing the different values of submergence. (Knapp-USGS)

2F. Groundwater

MINIMAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 2, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 04B. W73-10445 HYDRAULIC TESTING AND SAMPLING OF

GEOHYDROLOGIC STUDY OF THE GORT LOWLAND AND ADJACENT AREAS OF WESTERN IRELAND USING ENVIRONMEN-WESTERN IRELAND USING ENVIRONMENTAL ISOTOPES, Ceylon Univ., Peradeniya. R. Bowen, and P. W. Williams. Water Resources Research, Vol 9, No 3, p 753-758, June 1973. 3 fig, 2 tab, 9 ref.

Descriptors: *Karst hydrology, *Water circula-tion, Mixing, Groundwater movement, Karst, Tritium, Tracers, Stable isotopes, Oxygen isotopes, Hydrogeology, Groundwater basins. Identifiers: *Ireland (Gort Lowland).

Analyses of 0-18 and tritium in precipitation, surface waters, and groundwaters in western Ireland show that the groundwaters fall into a single group isotopically indicative of the good mixing to be expected in a karstic region. Components of modern (post-1954) recharge are present, suggesting relatively rapid circulation in the groundwater system. Some retarding of circulation is a result of 'covered karst' mantling. (Knapp-USGS) W73-10660

MASS BALANCE AND SPECTRAL ANALYSIS APPLIED TO KARST HYDROLOGIC NET-WORKS, Alberta Univ., Edmonton. Dept. of Geography.

Group 2F-Groundwater

Water Resources Research, Vol 9, No 3, p 749-752. June 1973. 4 fig. 8 ref.

Descriptors: "Water balance, "Karst hydrology,
"Statistical methods, Variability, Tracers,
Hydrologic budget, Caves, Subsurface flow,
Fourier analysis, Frequency analysis, Input-outut analysis.
Input-outidentifiers: Spectral analysis.

Identitiers: Spectral analysis.

Underground karst drainage systems can be studied by the input-output relations of rivers that flow through them. Tracers enable the quantity of water at a sink that flows to a specific spring, and the fraction of a given spring derived from a sink, to be calculated. When tracer methods are not applicable, cross-covariance and cross-spectral transfer function analysis can be used to examine input-output stage records. These give information about the vadose and/or phreatic nature of the system. An inaccessible karst drainage system in western Alberta has a tracer flow-through time of 80 to 130 hours and a positively skewed cross covariance of 70 to 124 hours; therefore the cave is not completely water filled. Additional unknown inputs are substantiated by a negatively peaking cross covariance. (Knapp-USGS)

BEHAVIOR OF GROUNDWATER FLOW SUB-JECT TO TIME-VARYING RECHARGE, Water Resources Engineers, Inc., Springfield, Va. M. T. Tseng, and R. M. Ragan. Water Resources Research, Vol 9, No 3, p 734-742, June 1973. 12 fig. 9 ref.

Descriptors: *Groundwater movement, *Recharge, *Equations, *Numerical analysis, Hydraulic models, Water table, Simulation analysis, Mathematical models.

Identifiers: Hele-Shaw models.

The dynamic response of two-dimensional unconfined aquifers subject to localized recharge was studied theoretically. The variations of free surface profiles, discharges, and the flow patterns with respect to time in both fully penetrated and partially penetrated aquifer systems are obtained by solving the governing partial differential equations numerically. The method treats the nonlinear free surface boundary as an initial condition, and the overall flow region is solved as a boundary value problem. The numerical results agree with experimental data obtained from Hele-Shaw models. The method may be applied to study the quantitative and qualitative changes in groundwater reservoirs resulting from artificial or natural recharge. (Knapp-USGS)

MATHEMATICAL SIMULATION OF THE SUB-SIDENCE OF VENICE: 1. THEORY, Centro di Ricera IBM di Venezia (Italy). G. Gambolati, and R. A. Freeze. Water Resources Research, Vol 9, No 3, p 721-733, June 1973. 3 fig. 30 ref.

Descriptors: *Land subsidence, *Withdrawal, *Mathematical models, Subsidence, Consolidation, Hydrogeology, Compaction, Water levels, Drawdown, Soil mechanics, Mathematical studies, Finite element analysis, Numerical analysis. Identifiers: "Venice (Italy).

Land subsidence theory was used to construct a mathematical model to simulate the subsidence at Venice. The model can be used to link realistically the occurrence of land subsidence to the groundwater withdrawals that are its cause. Approaches based on the independent solution of the diffusion equation are practical as long as the conditions underlying the development of the equation are recognized, and, if necessary, monitored. A two-step procedure is used to analyze the subsidence in the complex aquifer-aquitard system. First, the re-

gional hydraulic head drawdowns are calculated in a two-dimensional vertical cross section in radial coordinates using an idealized 10-layer representation of the geology. The computation are carried out with a model based on the diffusion equation and solved with a numerical finite element technique. The calculated head values in the aquifers are then used as time dependent boundary conditions in a set of one-dimensional vertical consolidation models solved with a finite difference technique and applied to a more refined representation of each aquitard. (Knapp-USGS)

SIMULATION OF HYDROCHEMICAL PATTERNS IN REGIONAL GROUNDWATER

TERNS IN REGIONAL GROUNDWAY FLOW, Alberta Univ., Edmonton, Dept. of Geology. For primary bibliographic entry see Field 02K. W73-10664

GEOMORPHOLOGY AND HYDROLOGY OF KARST DRAINAGE BASINS AND CAVE CHAN-NEL NETWORKS IN EAST CENTRAL NEW YORK, Texas Univ.. Austin. Dept. of Geological

Texas Univ., Austin. Dept. of Geological Sciences. V. R. Baker.

Water Resource Research, Vol 9, No 3, p 695-706, June 1973. 13 fig. 1 tab. 39 ref.

Descriptors: "Karst hydrology, "New York, *Karst, "Geomorphology, Hortons law, Caves, Meanders, Carbonate rocks, Subsurface drainage, Sinks, Springs, Terrain analysis, Hydrogeology, Groundwater movement, Tracers, Dye releases.

Surface water in the karst drainage basins of east central New York is collected by swallow holes on upland surfaces. Free surface streams, flowing through meandering cave conduits, provide links between the upland surface catchments and large karst springs draining into the major river valleys. Flow through the conduits fluctuates markedly with surface runoff. Mean velocities of 0.5 tt/sec were determined during a period of rapid snowmelt by dye tests. The cave conduits form an integral part of a drainage organization characterized by Horton's hierarchy stream numbers, lengths, and drainage areas. The conduits, the highest-order streams in the hierarchy, have meandering reaches with wavelengths directly related to upstream drainage area and contributed runoff. Both the morphology of the cave channels and the hydrology of the karst drainage basins are strikingly similar to those observed in surface water stream systems. (Knapp-USGS)

FATE OF SUSPENDED SEDIMENT DURING BASIN RECHARGE, Southwestern Great Plains Research Center, Bushland, Tex. For primary bibliographic entry see Field 02J. W73-10668

RAYLEIGH-RITZ AND GALERKIN FINITE ELEMENTS FOR DIFFUSION-CONVECTION PROBLEMS,

Manchester Univ. (England). Simon Engineering Lab. I. M. Smith, R. V. Farraday, and B. A. O'Connor.

Water Resources Research, Vol 9, No 3, p 593-606, June 1973. 16 fig. 26 ref.

Descriptors: *Finite element analysis, *Diffusion, *Convection, Numerical analysis, Groundwater movement, Mixing, Mathematical studies, Mathematical models, Porous media, Heat transfer. Identifiers: Galerkins method.

Finite element methods are presented for the solution of two-dimensional partial differential equations of interest in water resource problems. Galerkin's method for one-dimensional problems is shown to be a prototype finite element technique. Previous variational (Rayleigh-Ritz) formulations of finite elements for some problems are misleading and are of limited application when compared with Galerkin's method. The accuracy and stability of the techniques presented are discussed in relation to the numerical diffusion and dispersion phenomena prevalent in finite difference methods. (Knapp-USGS)

HYDROLOGIC STUDIES USING THE BOUSSINESQ EQUATION WITH A RECHARGE TERM, Stanford Univ., Calif. Dept. of Applied Earth Sciences.

Sciences. M. B. Zucker, I. Remson, J. Ebert, and E. Aguado. Water Resources Research, Vol 9, No 3, p 586-592, June 1973. 8 fig, 19 ref. NSF Grant GK-26153X1.

Descriptors: "Groundwater movement, "Equations, "Mathematical models, "V. ater balance, "Recharge, Hydrogeology, Dupuit-Forchheimer theory, Drawdown, Water yield. Identifiers: "Boussinesq equation.

The Boussinesq equation, which describes onedimensional unconfined groundwater movement,
was modified to accept groundwater recharge as
computed by a climatological soil-moisture
balance. It may be solved by using a predictor-corrector technique for nonlinear partial differential
equations. The method is useful in studies of the
effects of system parameters on groundwater and
in the determination of system parameters by the
inverse method. The effects of land development
on groundwater yield and on groundwater
discharge to streams are predicted. (KnappUSGS)
W73-10671

THE WATER RESOURCES PROGRAMS OF THE U.S. GEOLOGICAL SURVEY, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02E. W73-10674

ELECTROMAGNETIC DEPTH SOUNDING EX-PERIMENT ACROSS SANTA CLARA VALLEY, California Univ., Berkeley. Dept. of Geoscience Engineering. For primary bibliographic entry see Field 04B. W73-10720

ROLE OF CONNECTICUT RIVER FLOOD FLOWS IN RECHARGING GROUND-WATER FORMATIONS, Massachusetts Univ., Amherst. For primary bibliographic entry see Field 04B. W73-10733

GROUNDWATER RESOURCES OF COKE COUNTY, TEXAS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 04B. W72.1074.074

HYDROGEOLOGY AND ENGINEERING GEOLOGY (GIDROGEOLOGIYA I INZHENER-NAYA GEOLOGIYA).

Mezhdunarodnyy Geologicheskiy Kongress, XXIV Sessiya, Sektsii No 11 and 13, Simpozium No 1; Izdatel'stvo 'Nauka', Moscow, 1972. 167 p.

Descriptors: *Hydrogeology, *Engineering seology, *Groundwater, Groundwater movement, Climates, Pressure, Temperature, Permafrost,

Rocks, Rock properties, Structural geology, Water quality, Water chemistry, Geochemistry, Biochemistry, Paleohydrology, Geophysics, Seismic studies, Forecasting, On-site investigas, Conferences.

This collection contains papers prepared by the National Committee of USSR Geologists for presentation at the 24th Session of the International Geological Congress held in Montreal, Canada in August 1972. Various aspects of groundwater development are examined, including the role of climate, pressure, temperature, permafrost, and hydrogeological processes in the formation of the quality characteristics of groundwater Papers concerned with the application of mation of the quality characteristics of ground-water. Papers concerned with the application of the geological sciences to engineering practice deal with the physical characteristics of rocks, on-site investigations of rock properties, present geodynamic and geologic-engineering processes, and the role of geology in physiographic condi-tions altered by man. (Josefson-USGS) W73-10777

A CONTRIBUTION TO THE KNOWLEDGE OF PHYSICAL AND CHEMICAL PROPERTIES OF THE GROUND WATERS IN THE SLOVENE

THE GROUND WATERS IN THE SLOVENS KARST, Yugoslav Academy of Sciences and Arts, Zagreb. D. Novak.

D. Novak. Krs Jugosl Carsus Iugosl. Vol 7, No 5, p 171-188. 1971. Illus. In Czech. also. Identifiers: Chemical properties, *Groundwater, Physical properties, *Slovene Karst, Tempera-ture, *Yugoslavia, Hydrogen ion concentration.

During the period 1963 to 1966 observations of 10 resurgences in the Slovenian karst region were made. Water level, air and water temperature, total and carbonate hardness, pH and Cl contents were measured. The results were compared with changes in air temperature and quantity of precipitation. The necessity of intensive studies of changes in an emperative precipitation. The necessity of intensive studies of the influence of precipitation on karst ground-waters is evident. Diagrams show the values of carbonate hardness, temperature of water and Cl content.—Copyright 1973, Biological Abstracts, Inc. W73-10801

THE GROUNDWATER SUPPLY OF LITTLE CHINO VALLEY, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering. W. G. Matlick, and P. R. Davis.

w. c., Maurick, and P. R. Davis. In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 67-85, (1972). 8 fig. 2 tab, 1

Descriptors: "Groundwater resources, "Groundwater mining, "Withdrawal, "Groundwater recharge, "Water table, Irrigation, Water table aquifers, Artesian aquifers, Artesian quifers, Water quality, Water thydrologic data, Arizona.
Identifiers: Little Chino Valley (Arizona).

The Little Chino Valley in central Arizona presents an interesting groundwater study as withdrawals exceed recharge. The groundwater surface is falling at about 2 feet per year over most of the area due to large irrigation development. A shallow water table aquifer overlies the artesian aquifer and receives recharge from irrigation runoff. Water quality in the artesian aquifer is excellent. Water quality in the water-table aquifer is poorer, being somewhat higher in total salts, but is suitable for most domestic and agricultural uses. Specific yield for the supply area to the artesian aquifer is 12 percent, with estimated annual The Little Chino Valley in central Arizona

recharge of 4000 acre feet and leakage from the aquifer of 2300 acre feet. Water budget and use for the basin is presented with water level and water quality data. The multiphase aquifer system described and illustrated. (See also W73-10818) (Popkin-Arizona) W73-10824

SUBSIDENCE DAMAGE IN SOUTHERN ARIZONA, Arizona Univ., Tucson, Dept. of Hydrology and

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

C. A. McCauley, and R. L. Gum.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 87-94, (1972), 8 ref.

Descriptors: *Subsidence, *Damages, *Ground-water mining, *Aquifers, *Cost analysis, Economic impact, Water table, Compressive strength, Levees, Ditches, Water wells, Struc-tures, Inspection, Hydrologic data, Arizona.

Land is subsiding over a heavily mined aquifer in south central Arizona. Subsidence damages are inventoried to help provide a basis upon which cost studies can be performed to determine actions to lessen the economic impact of these damages. Water table drawdown produces increasing load-Water table drawdown produces increasing loading stress by three ways: changes in bouyant suport of aquifer grains, changes in water table, or both. Two types of subsidence are recognized phenomenon. Damages due to natural structures, and to man-made structures are reviewed. Agricultural damages include field releveling, ditch repair and well damage. Damages to transportational facilities include highways, bridges, pipelines, and railroads. Damages to domestic and urban structures are suggested. Questionnaires, interviews and on-site inspections were used to collect information on land subsidence damages in the study area. (See also W73-10818) (Popkin-Arizona) W73-10825

TRANSMISSIVITY DISTRIBUTION IN THE TUCSON BASIN AQUIFER, Arizona Univ., Tucson. Dept. of Hydrology and

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

D.J. Supkow.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972. in: Hydrology and Water Resources in Arzona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 113-123, (1972). 1 tab, 3 fig, 3

Descriptors: "Transmissivity, "Frequency distribution, "Hydrologic properties, "Aquifers, "Groundwater basins, Hydrologic data, Hydrologic systems, Model studies, Drainage patterns (Geologic), Alluvial aquifers, Aquifer testing, Water wells, Digital computers, Arizona, Arid lands.

Identifiers: Tucson Basin (Arizona), Horton's

The distribution of transmissivity within the Tuc-son Basin aquifer, as determined by pumping tests and reviewed in the construction of a digital model of the aquifer, was not totally random in space. Data tended to be distributed normally or log-nor-mally for biased samples of developed wells. A frequency distribution of transmissivity derived from a calibrated digital model is more nearly representative of the real world because the aquifer sample is without bias as the sample con-stitutes the entire aquifer. Geohydrologic setting, electric analog, and digital models of the basin are discussed. The theory of transmissivity distribu-tion in an arid land alluvial aquifer is developed

from Horton's laws of exponential relationship between stream order and drainage network parameters. It is hypothesized that there is an ex-ponential relationship between transmissivity of an alluvial aquifer. A statistical study was made of values derived from the digital model to test the probability density function hypothesized for transmissivity. The mean value is a function of cli-mate and drainage area. These hypotheses require further validation. (See also W73-10818) (Popkin-Arizona)

ELECTROMAGNETIC FIELDS ABOUT A LOOP SOURCE OF CURRENT,
California Univ., Berkeley. Dept. of Geoscience

Engineering.
J. Ryu, H. F. Morrison, and S. H. Ward.
Geophysics Vol 35, No 5, p 862-896, October 1970.
31 fig. OWRR B-067-CAL (2). 14-31-0001-1878.

Descriptors: *Electromagnetic waves, Measure-ment, *Exploration, Geophysics, Groundwater.

Integral expressions for the electromagnetic field components produced by a horizontal loop, carry-ing a current le and placed on or above the surface of an n-layered half-space, are deduced in a form such that numerical integration can be performed and completely general for all frequencies. They are constrained only to the uniformity of current easily. The expressions are tree of approximations and completely general for all frequencies. They are constrained only to the uniformity of current around the transmitting loop. The resulting computed electromagnetic fields are valid for arbitrary values of the electrical parameters sigma, mu, and epsilon. The quasi-static approximation for the region above the half-space, wherein the wave equation is replaced by the Laplace equation, can be avoided. Measurements outside the loop constitute induction depth sounding. Induction depth sounding curves of field components and magnetic polarization parameters show good resolution of otubsurface layering. The measurements of tils angle and/or ellipticity of the magnetic polarization ellipse should be made to determine earth layering because of the rapidity and ease of these measurements in field operation. The radius of the loop should, in the general case, be taken into account in theoretical computations. Measurements at the center of the loop constitute central induction sounding. Central induction sounding responses are diagnostic only for layered earth models in which conductivity increases with depth. Measurement of the quadrature part of the vertical magnetic field is particularly promising. Theoretical curves for earth models consisting of one layer overlying a half-space are given for the quasistatic case for induction depth sounding, and for the nonquasi-static (general) case for central induction sounding. The response from a homogeneous, conductive, magnetic half-space with the central induction sounding. The response from a homogeneous, conductive, magnetic half-space with the central induction sounding that is the determination of static magnetic permeability. The effect of ground conductivity should be included in making the normal correction to Turam data whenever the apparent conductivity of the ground is greater than (1/1000) mhos/m.

AN INVESTIGATION OF THE SESMIC WAVE PROPAGATION PROPERTIES OF A THIN UN-SATURATED LAYER AS A WAVE GUIDE, Michigan State Univ., East Lansing. Dept. of Geology. ary bibliographic entry see Field 04B.

NONLINEAR EQUATION OF UNSTEADY GROUNDWATER FLOW, California Univ., Santa Barbara. Dept. of Mechanical Engineering. J. C. Bruch, Jr.

Group 2F—Groundwater

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9589, p 393-403, March 1973. 5 fig. 7 ref, append. OWRR A-O39-CAL (2) WRC Proj W-336.

Descriptors: *Groundwater movement, *Finite element analysis, *Unsteady flow, Water table, Surface-groundwater relationships, Numerical analysis.

Unsteady groundwater movement may be described using a finite element weighted residual process to solve nonlinear partial differential equations. The groundwater in an unconfined aquifer may flow either into or out of a surface reservoir. Rectangular, as well as triangular, finite elements were used in a space-time solution domain. The weighting function was equal to the shape function defining the dependent variable approximation. The results were compared in dimensionless graphs with experimental as well as other numerical data. The finite element method compared favorably with these results and was easily programmed, stable, computationally fast, rapidly convergent, and does not require constant parameters over the entire solution domain. (Knapp-USGS)

UNSTEADY FLOW TWOARD AN ARTESIAN WELL, Kentucky Univ., Lexington. Dept. of Civil En-

Kentucky Univ., Lexington. Dept. of Civil Engineering. For primary bibliographic entry see Field 04B.

EFFECT OF A WATER TABLE AQUITARD ON DRAWDOWN IN AN UNDERLYING PUMPED ACHIEFE

Nevada Univ., at Reno. Center for Water Resources Research. For primary bibliographic entry see Field 04B. W73-10968

FRICTION FACTOR AND REYNOLDS

NUMBER IN POROUS MEDIA FLOW, Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering. A. Arbhabhirama, and A. A. Dinoy. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9784, p 901-911, June 1973. 6 fig, 2 tab, 10 ref, ap-

pend.

Descriptors: *Porous media, *Fluid friction, *Reynolds number, *Groundwater movement, *Hydraulic radius, Pores, Porosity, Fluid mechanics, Permeability, Hydraulic conductivity.

The concept of hydraulic radius of pore spaces is used to show that the square root of the permeability is the important length parameter in defining the friction factor and Reynolds number in flow through porous media. Hydraulic radius is defined by the Kozeny-Carman theory of hydraulic radius of pore space. Various porous media had different relationships between friction factor and Reynolds number. Experimental results showed a similarity to the Moody diagram used for pipe flow, with the ratio of particle mean diameter to the mean hydraulic radius of pore spaces as the third parameter. (Knapp-USGS)

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN NORTHERN ILLINOIS, 1966-

-1971, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 04B. W73-10993 FORMATION OF CAVITY IN CONFINED AQUIFER, Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 08B.
W73-1099

2G. Water in Soils

MICROBIAL CHANGES AND POSSIBLE
GROUND WATER POLLUTION FROM
POULTRY MANURE AND BEEF CATTLE
FEEDLOTS IN GEORGIA,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 05B.
W73-10403

INVESTIGATION OF NATURAL SEALING EF-FECTS IN IRRIGATION CANALS, Idaho Univ., Moscow. Dept. of Civil Engineering. For primary bibliographic entry see Field 04A. W73-10404.

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE, Central Soil Salinity Research Inst. Karnal (India).

A. K. Bandyopadhya.

Journal of the Indian Society of Soil Science, Vol
20, No 4, p 407-408, December 1972. 1 tab.

Descriptors: *Water level fluctuations, *Salinity, *Saline soils, *Water chemistry, *Leaching, Evapotranspiration, Salts, Water quality. Identifiers: *India.

The effect of depth and quality of groundwater on salinization of surface soil was studied in an area with fluctuating water table and water salinity. The water table fluctuated within 107 to 300 cm below the surface soil. Salinity of the groundwater was highest when the groundwater table was furthest from the soil surface. Salinity of the surface soil was also very high during this period. The water table started rising after the onset of monsoon. Recession of water table sets in after the cessation of rainfall. Salinity of the groundwater is diluted with rainwater as the water table came nearer to the surface of the soil. At the same time rainwater also releaches the salts from the soil, thereby reducing the salinity of the surface soil. Increased evaporation from the soil surface during the summer months depresses the water table and increases the concentration of salinity of the groundwater. (Knapp-USGS)

SOME PROBLEMS IN THE WATER REGIMEN OF WEAKLY LEACHED CINNAMON-BROWN SOILS IN THE PARKENTSAY RIVER BASIN (NEKOTORYYE VOPROSY VODNOGO REZHIMA KORICHNEVYKH SLABOVYSHCHELOCHENNYKH POCHV BASSEYNA R. PARKENTSAY),

SENNA R. PARKENTSAY),
Sredneaziatskii Nauchno-Issledovatelskii
Gidrometeorologicheskii Institut, Tashkent
(USSR).
V. Ye. Chub.

N. Ye. Chub.

In: Vodnyy balans territorii Sredney Azii;
Sredneaziatskiy Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 62
(77), p 91-96, Leningrad, 1972. 1 fig. 7 tab, 6 ref.

Descriptors: "Regimen, "Soil moisture, "Brown soils, Soil profiles, Soil horizons, Soil properties, Particle size, Air temperature, Precipitation (Atmospheric), Field capacity, Nuclear moisture meters, Variability.

Identifiers: USSR, "Parkentsay River basin, Hygroscopicity.

Neutron-meter measurements were made of the water regimen of weakly leached Cinnomon-Brown soils in the Parkentsay River basin in April-July, 1965-70. Air temperature and precipitation data for the periods of observation are given together with the hydrophysical properties and particle-size distribution of the soils. Soil moisture in the upper 5-cm layer is subject to maximum variations in time, while soil moisture in the 200-cm layer has the least variability. Maximum soil moisture was observed immediately after melting of the snow when it exceeded minimum field capacity, and minimum soil moisture was observed at the end of summer when it was less than maximum hygroscopicity. (See also W73-10448) (Josefson-USGS)

PERSISTENCE OF PARATHION IN SIX CALIFORNIA SOILS UNDER LABORATORY CONDITIONS, California University, Riverside, Citrus Research

California University, Riverside, Citrus Researc Center and Agricultural Experiment Station. For primary bibliographic entry see Field 05B. W73-10476

DIRECT TITRIMETRIC MICRODETERMINA-TION OF FLUORODIFEN, LINURON, FANERON, AND PEBULATE, Allahabad Agricultural Inst. (India). Dept. of Agronomy. For primary bibliographic entry see Field 05A. W73-10481

THE INTERFLOW PROCESS ON SLOPING WATERSHED AREAS, Clemson Univ., S.C. Dept. of Agricultural En-

gineering.
T. V. Wilson, and J. T. Ligon.
Available from the National Technical Information Service as PB-221 023, \$3.00 in paper copy, \$0.95 in microfiche. South Carolina Water Resources Research Institute, Report No 38, March, 1973. 58 p, 16 fig, 5 tab, append. OWRR B-008.85 (6)

Descriptors: Runoff, *Soil moisture, *Subsurface runoff, Percolation, Soil profiles, Infiltration, Movement, *South Carolina, Watersheds (Basins). Identifiers: *Piedmont (South Carolina).

The objectives were (1) to determine principal soil factors and conditions influencing the interflow process and (2) to develop relationships leading to quantitative predictions of interflow rates and volumes based on measurable soil characteristics. A field experiment was conducted which included measurements of precipitation, surface runoff, interflow runoff, and soil moisture content on a vegetated plot. Soil moisture tension was also measured at six depths during periods of wet-soil conditions. Interflow was observed twelve times during an eighteen month period. During each event, the topsoil was at or near saturation, indicating that interflow is primarily a saturated-flow phenomenon. The BZT soil layer with a permeability one-seventh that of the topsoil restricted vertical seepage, creating a free-water condition in the topsoil during periods of excessive precipitation. A soil moisture balance procedure was used to account for water in the topsoil, and could serve as a prediction tool for interflow on the plot. Extension of prediction to other watershed areas is doubtful because of the heterogeneity of soils. The potential for increasing groundwater recharge exists by mechanically or biologically increasing the hydraulic conductivity of the restricting layer thereby diverting surface and interflow runoff to downward seepage through the profile.

W73-10563

Water in Soils-Group 2G

INITIAL WETTING LOSSES INCURRED BY GROUND LEVEL STEREO GAGES, Eidgenoessische Technische Hochschule, Zurich, (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie. B. Sevruk.

Water Resources Research, Vol 9, No 3, p 759-763, June 1973. 3 fig. 2 tab, 19 ref.

Descriptors: *Rain gages, *Calibrations, *Wetting, Instrumentation, Gaging stations, Rainfall, Rain-fall disposition, Water loss, Evaporation. Identifiers: *Wetting loss (Rain gages).

The wetting losses of the rain catch of 32 gal-vanized ground-level storage gages with stereo ori-fices were investigated for the period June through September to determine a correction for the monthly rainfall totals in the basin of Montreux, Switzseland, The residence of the monthly rainfall totals in the basin of Montreux, Switzerland. The wetting of the gage per event as measured in the laboratory as well as in natural conditions ranged from 0.135 mm for the gage with a 15 deg inclined orifice to 0.205 mm for the gage with a 47 deg inclined orifice. The mean wetting correction of rain catch for 32 gages over a 10-year period for June through September amounted to 0.172 mm per event, or to 2.6% of precipitation catch. This percent varied only slightly in the respective years. (Knapp-USGS)

MOISTURE VARIATION AT THE SOIL SURFACE AND THE ADVANCE OF THE WETTING FRONT DURING INFILTRATION AT CON-

STANT FLUX,
Technion - Israel Inst. of Tech., Haifa. Dept. of
Civil Engineering.
C. Braester.

Water Resources Research, Vol 9, No 3, p 687-694, June 1973. 4 fig, 2 tab, 16 ref. USDA Grant FG-1s-287.

Descriptors: *Infiltration, *Soil water movement, *Numerical analysis, *Equations, Finite element analysis, Unsaturated flow, Hydraulic conductivity, Saturated flow, Diffusivity, Wetting.

The problem of infiltration at constant flux at the soil surface was solved approximately in an analytical closed form. The solutions are valuable when dealing with sprinkler irrigation or infiltration of rain. Infiltration into a semi-infinite soil column and infiltration into a soil column of finite column and infiltration into a soil column of finite length with a constant water table were con-sidered. Analytical and numerical results were compared. The analytical solutions provide a satisfactory prediction of the moisture content at the soil surface and of the advance of the wetting front. The results are presented in a dime form. (Knapp-USGS) W73-10666

ACCUMULATION OF FALLOUT CESIUM 137 IN SOILS AND SEDIMENTS IN SELECTED

WATERSHEDS,
Agricultural Research Service, Oxford, Miss.
Sedimentation Lab. Sedimentation Lab.
For primary bibliographic entry see Field 05B.
W73-10667

WATER INFILTRATION UNDER CENTER--PIVOTS, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 03F. W73-10698

THE EFFECT OF ROOT GEOMETRY ON THE YIELD OF WHEAT GROWING ON STORED

WATER,
Commonwealth Scientific and Industrial Research
Organization, Canberra (Australia). Div. of Land
Research and Regional Survey.
For primary bibliographic entry see Field 03F.

UNDERGROUND CORROSION AND SALT IN-FILTRATION,
Connecticut Univ., Storrs, Dept. of Civil Engineering. For primary bibliographic entry see Field 04C. W73-10712

INFLUENCE OF SURFACE AND NEAR-SU-RFACE CALICHE DISTRIBUTION ON INFIL-TRATION CHARACTERISTICS AND FLOOD-ING, LAS VEGAS AREA, NEVADA, Nevada Univ., Reno. Center for Water Resources ry bibliographic entry see Field 02E.

FILTERS WITH A CONSTANT MOISTURE POTENTIAL AT THE SURFACE (FIL'TRY S POSTOYANNYM POTENTSIALOM VLAGI NA

POVERKHNOSTI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut
Tortyanoi Promyshlemosti, Leningrad (USSR).
I. I. Mogilevskiy, and T. P. Cheburkova.
Pochvovedeniye, No 5, p 132-133, May 1972. 1 fig,

Descriptors: *Filters, *Surfaces, Sands, Peat, Particle size, Measurement.
Identifiers: *USSR, *Moisture potential.

A device is proposed for maintaining a given moisture potential at the surface of a filter. The working surface of the filter is several times larger than that of a Schott filter, and the large working volume can be used to measure the moisture potential directly at the surface of the filter as well as at different points on a soil sample. (Josefson USGS) W73-10774

MOVEMENT OF WATER VAPOR IN SOIL UNDER ISOTHERMAL CONDITIONS (DVIZHENIYE PAROV VODY V POCHVE V IZOTER-MICHESKIKH USLOVIYAKH), D. N. Onchukov, V. P. Ostapchik, and V. G.

Charnyy. Pochvovedeniye, No 5, p 79-85, May 1972. 5 fig.

Descriptors: "Soil physics, "Soil water movement, "Water vapor, "Isotherms, Temperature, Humidity, Moisture content, Vapor pressure, Soil physical properties, Particle size, Instrumentation, Equations Equations. Identifiers: USSR, Vapor density.

Isothermal movement of water vapor in soil was investigated in a sample of coarse clay taken from the upper (6-10 cm) layer of soil on a test plot of the Kalinia kolkhoz, Krasnogvardeyskoye Rayon, Crimean Oblast. Vapor sorption by the soil and vapor migration toward the soil surface are analyzed, and formulas are derived for calculating the vapor flux density as a function of either the relative humidity of the air above the soil or of the soil moisture gradient. For average soil moisture gradients observed in surface layers of nonirgiated Crimean soils, the vapor flux density under isothermal conditions is 8.28 X 0.001 kg/sq m/hr. A number of important physical characteristics of the soil are computed, including particle-aize distribution, the sorption isotherm, and the dependence of the coefficients of vapor conductivity and molecular vapor flow on the soil moisture content. (Josefson-USGS)

WATER REGIME OF SOD-BROWN SOILS AND RELATION OF TEA-LEAF YIELD TO PRECIPITATION (VODNYY REZHIM DERNOVO-BUROZEMNYKH POCHV I

ZAVISIMOST' UROZ LISTA OT OSADKOV), P. M. Bushin. UROZHAYA CHAYNOGO

Pochvovedeniye, No 5, p 68-78, May 1972. 3 fig. 5 tab. 21 ref.

Descriptors: *Soil physics, *Soil-water-plant relationships, *Soil moisture, *Precipitation (Atmospheric), *Brown soils, Soil properties, Plant growth, Crop production, Irrigation practices, Correlation analysis, Regression analysis, Porecasting, Identifiers: USSR, *Tea plants.

The water regime of Sod-Brown soils and the growth and production of tea on them were investigated in 1966-69 at the Adler tea farm in Krasnodar Territory. Quantitative relations are established between precipitation and the capacity of a tea shrub to form shoots during individual contractive acceptance of the state growing periods. The possibility of preparing a short-term forecast of tea-leaf harvest time and of applying different methods of irrigation to tea plantings is discussed and justified. (Josefson-W73-10776

WATER FROM ARID LOESS SOILS DURING MIGHTLY TEMPERATURE INVERSION PHASE BY TRITIUM-LABELING OF PREDETERMINED SOIL LAYERS, For primary bibliographic entry see Field 02D. W73-10802 DETERMINATION OF EVAPORATION OF

SIGNIFICANCE OF ANTECEDENT SOIL MOISTURE TO A SEMIARID WATERSHED RAINFALL RUNOFF RELATION, Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.

Southwest Watershed Research Center.

D.L. Chery, Ir.

In: Hydrology and Water Resources in Arizona
and the Southwest, Vol 2, Proceedings of the 1972
meetings of the Arizona Section, American Water
Resources Assn., and the Hydrology Section,
Arizona Academy of Science, May 5-6, 1972,
Prescott, Arizona, p 385-406, (1972). 3 tab, 11 fig,
10 cef

Descriptors: *Antecedent moisture content, *Soil moisture, *Rainfall-runoff relationships, *Streamflow, Arid lands, Peak discharge, Runoff, Hydrologic data, Watersheds (Basins), Statistical methods, New Mexico, Southwest U.S.

Numerous reports from the Southwest claim that soil moister prior to rainfall-runoff event has no influence on the resulting flow volumes and peak rates. Runoff occurs from many storms that would not be expected to produce runoff, and an explanation lies in the occurrence of antecedent rains. This hypothesis is tested by dividing runoff events into 2 subsets—one with no rain within the preceding 120 hours, and the other with some rain within the preceding 24 hours—and to test the null hypothesis. The hypothesis was tested with rainhypothesis. The hypothesis was tested with rainfall and runoff data from a 40-acre Agricultural Research Service watershed west of Albuquerque, New Mexico, using the Wilcoxon's rank sum test. Various levels of statistical significance are discussed, and shown graphically, to conclude conclusively that antecedent rainfall influences runoff from a semiarid watershed. (See also W73-1084) W73-10841

DISPOSITION IN EPHEMERAL STREAM CHANNELS, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. For primary bibliographic entry see Field 02E. W73-10846

Group 2G-Water in Soils

SEASONAL DYNAMICS OF CLAYING MEADOW SOIL OF THE ALAZAN VALLEY,

Dokl Akad Nauk Az SSR. Vol 27, No 8, p 65-68,

1971. English summary. Identifiers: *Alazan Valley, *Clays, Meadow, Seasonal, *Soil moisture.

Spring is characterized by abundant soil moisture and intensive clay development. Fe mobility is high. Clay development slows down in summer as sub-soil water decreases.—Copyright 1973, Biological Abstracts, Inc.

WATER VAPOR ADSORPTION BY WATER--REPELLENT SOILS AT EQUILIBRIUM,

California Univ., Riverside. S. Miyamoto, J. Letey, and J. Osborn. Soil Science, Vol 114, No 3, p 180-184, Septemb 1972. 4 fig. 1 tab, 14 ref. OWRR B-072-CAL (9).

Descriptors: *Adsorption, *Water vapor, *Wetta-bility, *Soil moisture, Moisture tension, Soil physical properties, Porous media, Surface tension, Wetting. Identifiers: *Water-repellent soils.

Water vapor adsorption isotherms were measured in a variety of porous materials which differ in water repellency. These data were then used to water repeliency. These data were time used to calculate the heat of adsorption, integral free ener-gy of adsorption, and check the applicability of Adamson's method in porous media. No specific trend or differences which could be uniquely related to water repellency were found on the amount adsorbed per unit area, the shape of ad-sorption isotherm, the heat of adsorption and the integral free energy of adsorption. The differences in initial vapor adsorption levels under the con-trolled temperature did not influence the value of trolled temperature did not influence the value of water tension. The apparent independence of water vapor adsorption on the differences in surface tension of porous media implied that mechanisms of wettability and repellency of porous media may operate at the portion which is beyond vapor adsorption or masked by other soil properties. (Knapp-USGS)
W73-10966

PRELIMINARY OBSERVATIONS ON DOWNSLOPE MOVEMENT OF SOIL DURING THE FALL IN THE CHINOOK BELT OF AL-

For primary bibliographic entry see Field 02J. W73-10977

IRRIGABILITY CLASSIFICATION OF SOILS, (IRRIGABLE SOILS OF NEVADA).

For primary bibliographic entry see Field 03F.

AN ANALYSIS OF STREAM TEMPERATURES IN LOUISIANA,

Geological Survey, Baton Rouge, La. A. J. Calandro.

Louisiana Department of Public Works Technical Report No 6, 1973. 16 p, 4 fig, 3 tab, 9 ref.

Descriptors: *Water temperature, *Streams, *Louisiana, Basic data collections, Aquatic environment, Environmental effects, *Solar radiation, Air temperature, Seasonal, Diurnal, tion, Air temperature, Seasonal, Diurnal, Monthly, Depth, Deep water, Physical properties, Thermal properties, Variability, Correlation analy Identifiers: Shade

In Louisiana air temperatures during the summer months are approximately the same throughout the State; water temperatures of streams, however, become progressively cooler from the north

to south. During the winter months air tempera-tures are cooler in the northern part of the State than in the central or southern parts, and water temperatures are about 5 deg F (3 deg C) cooler. A method of analysis developed by M. R. Collings was used to obtain midmonthly temperatures from was used to obtain midmonthly temperatures from miscellaneous water-temperature data from 71 sites. When compared to long-term daily temperature stations, the method works very well for Louisiana streams. Monthly temperature duration, average monthly temperatures, and monthly extremes are shown for nine stations throughout the State. These stations are located on the larger streams and rivers. The major natural factors affecting stream temperatures in Louisiana are solar radiation, shade, air temperature, and stream depth. The most important of these is solar radiation. (Woodard-USGS) W73-10987

UPLIFT PRESSURE BELOW HORIZONTAL APRON WITH CUTOFF AT INTERMEDIATE
POINTS, FOUNDED ON ANISOTROPIC PERVI-OUS MEDIUM OF FINITE DEPTH, Jodphur Univ. (India).

For primary bibliographic entry see Field 08B. W73-10995

2H. Lakes

A FINITE ELEMENT SOLUTION FOR TWO-

Water Resources Engineers, Inc., Walnut Creek. Calif

Caut.

I. P. King, W. R. Norton, and G. T. Orlob.

Available from the National Technical Information Service as PB-220 967, \$3.00 in paper copy, \$9.95 in microfiche. Final report, March 1973. 80 p, 16 fig, 3 tab, 32 ref. OWRR C-2052 (3670) (1).

Descriptors: Fluid mechanics, Flow, *Density stratification, Computer models, *Computer programs, *Stokes law, *Diffusion, *Advection, Turbulent flow, Weirs, Unsteady flow, Viscosity, Lakes, Water properties, *Stratified flow. Identifiers: *Finite Element Method, *Two-dimensional flow, Turbulent exchange coefficient, Nonlinear equations.

Nonlinear equations.

A finite element formulation is presented for solution of problems of two-dimensional flow (vertical elevation). The equations describing the phenomena are assumed to be the two-dimensional version of the Navier Stokes Equations coupled to the advection-diffusion equation for variations in density. In these nonlinear equations the conventional coefficient of viscosity is replaced by a turbulent exchange coefficient when flow is in the turbulent range. The Galerkin method of weighted residuals is described for the finite element method and the use of the Newton-Raphson iterative scheme is explained with respect to incorporation of nonlinear terms in the solution procedure. The result of this derivation is a set of nonlinear simultaneous equations, and implications and programming considerations are discussed. Examples of both constant density (homogeneous) flow and density stratified flow over a submerged weir are included. These examples are compared to experimental results and their accuracy assessed. ples are compared to experimental results and their accuracy assessed. W73-10418

WATER RESOURCES OF MOUNTAIN LAKES WATER RESURCES OF MOUNTAIN LARES
IN SOVIET CENTRAL ASIA (VODNYYE RESURSY GORNYKH OZER SREDNEY AZII),
Sredneaziatskii Nauchno-Issledovatelskii
Gidrometeorologicheskii Institut, Tashkent

. N. Reyzvikh, A. M. Nikitin, and N. M.

In: Vodnyy balans territorii Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometecologicheskiy Institut Trudy, No 62 (77), p 17-29, Leningrad, 1972.1 fig., 7 tab., 7 ref.

Descriptors: "Water resources, "Lake, "Lake morphology, "Lake morphometry, "Mountains, Elevation, Volume, Areal, Water balance, Water types, Water quality, Water chemistry. Identifiers: USSR, "Soviet Central Asia, Lake classification, Mineralization.

There are 7,172 lakes in Soviet Central Asia and the total water surface area is 10,250 sq km. Of the estimated 50.38 billion cu m of water in the lakes (determined to within plus or minus 5%-10% of true values), 20.3 billion cu m is freshwater, 26 bilion cu m is brackish water, and 4.08 billion cu m is water of unknown quality. The volume of water in five of the largest lakes (Iskanderkul', Yashil'kul', Sarezskoye, Karakul', and Sonkul') is 43.2 billion cu m, or 86% of the total volume of water in mountain lakes of the region. (See also W73-10448) (Josefson-USGS) There are 7,172 lakes in Soviet Central Asia and

OF ROACH SUPPLY UN-DERYEARLINGS RUTILUS RUTILUS (L.) IN THE MOZHAISKII RESERVOIR (IN RUSSIAN), Moscow State Univ. (USSR). Dept. of Ichthyolo-

V. A. Grigorash, V. D. Spanovskaya, and T. V.

Lebedeva. Vopr Ikhtiol. Vol 12, No 3, p 504-512. 1972. Illus. Identifiers: *Food (Fish), *Mozhaiskii Reservoir, *Roach, Rutilus-Rutilus, Underyearlings, USSR.

The daily rhythm of feeding, diet and growth rate for roach juveniles at different stages of develop-ment was investigated in the Mozhaiskii Reservoir ment was investigated in the Mozhaiskii Keservoir during the first 10 yr of its existence. The hydrological regime and fish populations varied during this period. The daily ration for larvae during years with a good food supply varied from 21.7 to 26.4%, and for frys it was 15% of body weight. When food was scarce the indices were 12.8-14.6% when 1000 was scarce the indices were 12.8-14.6% and 7.9% respectively. The average daily weight increase during the larval period in good years was 13-20%, in bad years 5-9%.—Copyright 1973, Biological Abstracts, Inc. W73-10458

PERIODICITY PHYTOPLANKTON ASSEMBLAGE OF A HIGH MOUNTAIN LAKE, Innsbruck Univ. (Austria). Inst. of Zoology. For primary bibliographic entry see Field 05C. W73-10461

AN ANALYSIS OF FACTORS GOVERNING PRODUCTIVITY IN LAKES AND RESER-VOIRS, Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology. nary bibliographic entry see Field 05C. For primar W73-10475

CHEMICAL EQUILIBRIUM MODELS OF LAKE KEYSTONE, OKLA., Oklahoma State Univ., Stillwater. Dept. of Chemistry. ry bibliographic entry see Field 05B.

BIOLOGICAL NITROGEN FIXATION IN THE GREAT LAKES, Wisconsin Univ., Madison, Dept. of Biochemistry.
For primary bibliographic entry see Field 05C.

A FIELD FIXATION TECHNIQUE FOR DIS-SOLVED PHOSPHATE IN LAKE WATER, Minnesota Univ., Minneapolis. Limnological Research Center. ry bibliographic entry see Field 05C. For primar W73-10519

OF TWO MICHIGAN LAKES, Michigan State Univ., East Lansing. For primary bibliographic entry see Field 05C. W73-10538 THE CARBON CYCLE IN THE EPILIMNION

DIATOMS IN ALKALINE, SALINE LAKES: ECOLOGY AND GEOCHEMICAL IMPLICA-

TIONS, Duke Univ., Durham, N.C. Dept. of Zoology. For primary bibliographic entry see Field 05C. W73-10545

THE LIMNOLOGY OF STOCKBRIDGE BOWL, STOCKBRIDGE, MASSACHUSETTS, Massachusetts Univ., Amherst. Dept. of Zoology. For primary bibliographic entry see Field 05C.

DATA ON THE FEEDING OF THE YOUNGEST

DATA ON THE FEEDING OF THE YOUNGEST AGE GROUPS OF PIKE PERCH LUCIOPERCA LUCIOPERCA (L.) IN THE PSKOV-CHUDSKOE LAKE, (IN RUSSIAN), Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
I. T. Nigonovskaya.
Vopr Ikhtiol. Vol 12, No 3, p 521-531, 1972. Illus. Identifiers: Age groups (Fish), Feeding (Fish), Lakes, Lucioperca-Lucioperca, *Pike perch, *Pskov-Chudskoe Lake, Roach, Stint, USSR.

The diet and intensity of feeding were studied for pike perch in different regions of the Pskov-Chudskoe Lake during different seasons of the first 2 yr of life. Variations were determined by the abundance and accessibility of food. In the summer of the second yr prey of the same age as the pike-perch became inaccessible because of size. During the transfer to fooding on a new generation of prey, the index of stormach fullness decreased substantially. Stint was the most valuable food. compared to roach and perch.—Convble food, compared to roach and perch.—Copyright 1973, Biological Abstracts, Inc.
W73-10613

AN ECOLOGICAL STUDY OF THREE FRESH WATER PONDS OF HYDERABAD-INDIA: II. THE ENVIRONMENT, Osmania Univ., Hyderabad (India). Hydrobiology

For primary bibliographic entry see Field 05C. W73-10625

THE EVALUATION OF SMALL BODIES OF WATER AS FUNCTIONAL ECOLOGICAL UNITS AND CONSEQUENCES FOR ECOLOGI-CAL TERMINOLOGY, (IN GERMAN), Humboldt-Universitaet zu Berlin (East Germany).

Museum fuer Naturkunde. D. H. H. Kuehlmann.

Pol Arch Hydrobiol. Vol 19, No 1, p 123-150, 1972.

Illus. English summary.
Identifiers: Ecological studies, Small water bodies, Terminology, *Food webs, *Ecosystems.

A new terminology for discussing ecosystems is introduced and illustrated by complex data from 3 different temporary pools. Cycles of O2, CO2 and N, as well as food webs networks were used as riteria. A conclusion emerges that the widely used term 'ecosystem' is not quite precise. A new terminology is suggested, referring to the close or open character of the cycle of metabolism in a reservoir .-- Copyright 1973, Biological Abstracts, inc. W73-10640

THE PHYTOPLANKTON OF LAKE OVRE HEIMDALSVATN, CENTRAL SOUTH NOR-

MEIMDALSVATN, CENTRAL SOUTH N WAY, 1969-70, Norwegian Inst. for Water Research, Oslo. For primary bibliographic entry see Field 05C. W73-10644

SOME ECOLOGICAL ASPECTS OF A NEST-ING COLONY OF HERONS,

Auburn Univ., Ala. C. A. McDonald. Ph D Dissertation, August 27, 1971. 118 p, 11 fig, 17 tab, 111 ref. OWRR A-010-ALA (2).

Descriptors: *Eutrophication, *Swamps, *Environmental effects, *Wading birds, *Georgia, Algae, Aquatic plants, Limnology, Aquatic productivity, Nutrients, Nitrates, Phosphates, Productivity

Identifiers: Duckweed, *Herons, *Anhingas,

A swamp in Clay County, Georgia, was studied to determine the ecological effects of a nesting colony of herons and anhingas. A similar swamp determine the ecological effects of a nesting colony of herons and anhingas. A similar swamp without herons was used for comparison. Within the colony area the understory was reduced or dying even. Larger numbers of dead limbs were found in the trees. These differences indicate a toxic effect on the vegetation by the excrements of the herons. Duckweed, forming a dense layer throughout the colony, was replaced during the summer by an algal mat composed primarily of Euglena. Neither the duckweed nor the algal mat was present in the swamp lacking the herons. was present in the swamp lacking the herons. Levels of nitrogen and phosphorus were higher in the swamp with the herons. The concentrations in-creased with an increase in the size of the colony and decreased with an increase in distance from the colony. (Knapp-USGS) W73-10651

DATA ON SELECTED LAKES IN WASHING-TON, PART I,

Geological Survey, Tacoma, Wash. M. R. Collings. Geological Survey open-file report, 1973. 179 p, 86

Descriptors: *Lakes, *Limnology, *Thermocline, *Water quality, *Washington, Lake morphology, Data collections, Water temperatures, Thermal stratification, Dissolved oxygen, Mixing, Water circulation, Water pollution sources, Nutrients, Water level fluctuations, Precipitation (Atmospheric), Seasonal, Inflow, Discharge (Water).

Physiographic, physical, chemical, and floral characteristics are described for 22 lakes in western Washington State. Most of the lakes are used primarily for recreation, have origins related to continental and alpine glaciation, and are in areas underlain by glaciofluvial and (or) volcanic deposits that are covered by soils grading from gravel to clay. The cover of the lake basins ranges from conifer forests with some deciduous trees to grasslands and urban developments. The lakes range in surface area from 0.27 to 49.4 million square feet, in volume from 3.34 to 2,624 million square feet, in volume from 3.34 to 2,027 secubic feet, in mean depth from 11.1 to 70.8 feet, and maximum depth from 20 to 117 feet. Generally secure are files of the lakes show the water-temperature profiles of the lakes show total mixing during the winter, with a uniform temperature-depth profile, and, beginning in the spring, thermal stratification which reaches a maxspring, thermal stratification which reaches a max-imum during the summer, after which the mixing cycle begins again in the late fall. Profiles of the dissolved oxygen concentration in most of the lakes have the same relative shape as the tempera-ture profiles. However, during the summer eight of the lakes also developed a pronounced positive heterograde zone of oxygen supersaturation in the central part of the depth profile. In several lakes, mineral and nutrient constituents increased from the epilimnion during summer stratification. Lakelevel fluctuations reflect the precipitation pattern in western Washington. (Woodard-USGS) W73-10654

A HIGH-MOUNTAIN LAKE (VORDERER FIN-STERTALER SEE, KUEHTAI, AUSTRIA) AS A
MODEL OF ENERGY FLOW THROUGH A
FRESHWATER ECOSYSTEM, (IN GERMAN),
Innsbruck Univ. (Austria). Inst. of Zoology.
R. Pechlaner, G. Bretschko, P. Gollmann, H.

Pfeifer, and M. Tilzer. Verh Dtsch Zool Ges. 65, p 47-56, 1971. Illus. En-

Identifiers: Animals, *Austria, Biomass, Ecosystem, Energy, Flow, Lakes, Model studies, *Mountain lakes.

The extreme character of environmental conditions in lakes above timber line favors ecological research in such ecosystems both by reducing species diversity and by facilitating the analysis of the effects of abiotic factors on the species present. The changes were monitored in physical and chemical conditions and plant and animal life in Vorderer Finstertaler See since 1968. With the exception of benthic bacteria all trophic levels were studied for biomass and production rate of the dominant species. The results attained so far are summarized and the main paths of energy flow through the ecosystem are shown and discussed.— Copyright 1973, Biological Abstracts, Inc.

CORRELATED STUDIES OF VANCOUVER CORRELATED STUDIES OF VANCOUVER LAKE-HYDRAULIC MODEL STUDY, Washington State Univ., Pullman. R.L. Albrook Hydraulic Lab. For primary bibliographic entry see Field 05B. W73-10881

CORRELATED STUDIES OF VANCOUVER LAKE - WATER QUALITY PREDICTION STU-DY, Washington State Univ., Pullman. Dept. of Civil

Engineering. For primary bibliographic entry see Field 05B. W73-10882

PESTICIDE-SEDIMENT-WATER INTERAC-TIONS, Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research

For primary W73-10892 ary bibliographic entry see Field 05B.

BIOLOGICAL PRODUCTIVITY OF LAKES KRIVOE AND KRUGLOE,
Akademiya Nauk SSSR, Leningrad. Akademiya Nauk SSSR, Lening Zoologicheskii Instut. For primary bibliographic entry see Field 05C. W73-10896

THE SEASONAL VARIATION OF SOME ECOLOGICAL EFFICIENCIES AND PRODUC-TION RATES IN THE PLANKTON COMMUNI-TY OF SEVERAL POLISH LAKES OF DIF-FERENT TROPHY, Polish Academy of Sciences, Warsaw. Inst. of

Ecology. For primary bibliographic entry see Field 05C. W73-10897

Group 2H-Lakes

THE PRODUCTION PROCESSES IN SEVERAL Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology; and Warsaw Univ. (Poland). Dept. of Hydrobiology.

of Hydrobiology.

For primary bibliographic entry see Field 05C.

W73-10898

THE MODELLING OF THE ECOSYSTEM OF LAKE DALNEE ON AN ELECTRONIC COM-PUTER,

ary bibliographic entry see Field 05C.

BIOLOGICAL PRODUCTIVITY AND BALANCE OF ORGANIC SUBSTANCE AND ENERGY IN

LAKE BAIKAL,
For primary bibliographic entry see Field 05C.
W73-10900

DISTRIBUTION PATTERN OF PHYTOPLANK-TON AND BACTERIA, MICROBIAL DECOM-POSITION OF ORGANIC MATTER AND BAC-TERIAL PRODUCTION IN EUTROPHIC, STRATIFIED LAKE, Max-Planck-Institut fuer Limnologie zu Ploen (West Germany). For primary bibliographic entry see Field 05C.

For primar W73-10901

THE PRODUCTION PROCESSES IN TWO HIGH-MOUNTAIN LAKES (VOR-DERER AND HINTERER FINSTERTALER SEE, KUHTAI,

AUSTRIA), Innsbruck Univ. (Austria). Inst. of Zoology. For primary bibliographic entry see Field 05C.

PRODUCTION AND DECOMPOSITION IN THE EULITTORAL ZONE OF LAKES, Warsaw Univ. (Poland). Dept. of Hydrobiology. For primary bibliographic entry see Field 05C W73-10903

THE CHAR LAKE PROJECT. A STUDY OF ENERGY FLOW IN A HIGH ARCTIC LAKE, Toronto Univ. (Ontario). Dept. of Zoology. For primary bibliographic entry see Field 05C. W73-10904

LAKE GEORGE, UGANDA. STUDIES ON A LARE GEORGE, UGANDA. STUDIES ON A TROPICAL FRESHWATER ECOSYSTEM. Royal Society African Freshwater Biological Team, Lake Katwe (Uganda). For primary bibliographic entry see Field 05C. W73-10905

FUNCTIONS AND INTERACTIONS OF DIS-SOLVED ORGANIC MATTER AND THE LIT-TORAL ZONE IN LAKE METABOLISM AND EUTROPHICATION, Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station. For primary bibliographic entry see Field 05C. W73-10906

UNIQUENESS OF SALT LAKE

Monash Univ., Clayton (Australia). Dept. of Zoology. For primary bibliographic entry see Field 05C. W73-10907

ECOSYSTEMS,

SOME INTERIM RESULTS OF SOVIET IBP IN-VESTIGATIONS ON LAKES, Akademiya Nauk Zoologicheskii Institut. For primary bibliographic entry see Field 05C.

W73-10908

BIOLOGICAL PRODUCTIVITY OF DIF-FERENT TYPES OF LAKES, Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut. For primary bibliographic entry see Field 05C.

TROPHIC STRUCTURE OF LAKE TATSU-N-UMA, AN ACIDOTROPHIC LAKE IN JAPAN, WITH SPECIAL REFERENCE TO THE IM-PORTANCE OF THE TERRESTRIAL COMMU-

Yamagata Univ. (Japan). Dept. of Biology. For primary bibliographic entry see Field 05C. W73-10910

PHYTOPLANKTON PRODUCTION, CHEMI-CAL AND PHYSICAL CONDITIONS IN LOCH

LEVEN,
Nature Conservancy, Edinburgh (Scotland); and
Freshwater Fisheries Lab., Pitlochry (Scotland).
For primary bibliographic entry see Field 05C.
W73-10922

THE REGULATION OF NET PRIMARY PRODUCTION IN LAKE GEORGE, UGANDA, EAST AFRICA,

ROYAL Society African Freshwater Biological Team, Lake Katwe (Uganda). For primary bibliographic entry see Field 05C. W73-10926

COMPARATIVE TRENDS OF PRIMARY PRODUCTIVITY AND SOME CHEMICAL PARAMETERS IN LAKE MAGGIORE ON A PLURIANNUAL BASIS, Istituto Italino di Idrobiologia, Pallanza (Italy). For primary bibliographic entry see Field 05C. W73-10927

COMPARISON OF THE PHYSICAL CHEMCIAL ENVIRONMENTS OF VOLTA LAKE AND LAKE NASSER, Lake Nasser Development Centre, Aswan (E-VOLTA gypt).
For primary bibliographic entry see Field 05C.
W73-10931

SOME CHARACTERISTICS OF A SHALLOW ENDORHEIC LAKE IN ITS DRYING PHASE AND ITS REVOVERY PHASE. LAKE CHILWA (MALAWI), Malawi Univ., Limbe. For primary bibliographic entry see Field 05C. W73-10932

COMPLEXING PROPERTIES NITRILOTRIACETIC ACID IN THE LAKE EN-

VIRONMENT, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters. For primary bibliographic entry see Field 05C. W73-10942

EFFECT OF BOTTOM TOPOGRAPHY, EDDY DIFFUSIVITY, AND WIND VARIATION ON CIRCULATION IN A TWO-LAYER CIRCULATION IN A TWO-LAYER STRATIFIED LAKE, National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center, R. T. Gedney, W. Lick, and F. B. Molls. Available from NTIS, Springfield, Va 22151 as NASA TN D-7235. Price \$3.00 printed copy; \$0.95 microfiche. NASA Technical Note D-7235, March 1973, 44 p. 5 fig. 9 ref.

Descriptors: *Water circulation, *Stratified flow, Descriptors: "Water circulation, "Stratified How, *Lakes, Lake morphology, Winds, Limnology, Model studies, Mathematical models, Ther-mocline, Epilimnion, Hypolimnion, Diffusion, Ed-dies, Analytical techniques, Forecasting, Wind velocity, Lake morphometry. Identifiers: Lake bottom topography.

Observations of stratified lakes suggest that during steady wind periods they may be modeled by considering the lake to be made up of two homogeneous layers, each with different densities and eddy diffusivities with the interface between the two layers being located at the thermocline. The position of the thermocline and the velocities in both layers are calculated from an asymptotic solution of the shallow lake equations when the Ekman number in the epilimnion (upper layer) is of order one, but the rato of hypolimnion (lower layer) to epilimnion eddy diffusivities is much less than one. Large differences in the thermocline shape one, but the rato of hypolimnion (lower layer) is of order optimization eddy diffusivities is much less than one. Large differences in the thermocline shape and the velocities occur between the solution for uniform wind stress and the one for unit order wind stress gradients. For the latter solution the hypolimnion eddy diffusivity magnitude and the bottom topography have a large and important effect. (Woodard-USGS)
W73-10973

ECOLOGY OF VIBRIO PARAHAEMOLYTICUS IN CHESAPEAKE BAY, Georgetown Univ., Washington, D.C. Dept. of Biology.

For primary bibliographic entry see Field 05C. For primary W73-11001

DISSOLVED OXYGEN AND TEMPERATURE IN A STRATIFIED LAKE, Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-11005

2I. Water in Plants

INFLUENCE OF VEGETATION AND SUB-STRATE ON STREAMWATER CHEMISTRY IN NORTHERN UTAH, Utah Center for Water Resources Research, Logan. For primary bibliographic entry see Field 05B. W73-10413

INTERCEPTION OF PRECIPITATION BY INTERCEPTION OF PRECIPITATION BY
VEGETATION AND ITS DETERMINATION IN
WATER-BALANCE INVESTIGATIONS
(PEREKHVAT ATMOSFERNYKH OSADKOV
RASTITEL'NOST'YU I YEGO UCHET PRI
VODNOBALANSOVYKH ISSLEDOVANIYAKH),
Serdangiathii Nambar Isladanatsikii

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut. Taskkani (USSP) (USSR). For primary bibliographic entry see Field 02B. W73-10453

NATURE OF LARVAL AND JUVENILE GROWTH OF SOME FRESHWATER FISH AT DIFFERENT STATES OF DEVELOPMENT, (IN RUSSIAN), Kazan State Univ. (USSR). Dept. of Vertebrate

Zoology. V. A. Kuznetsov.

Vopr Ikhtiol, Vol 12, No 3, p 479-489, 1972. Illus. Identifiers: Bream, Custacca, *Fresh water fish, *Juvenile growth, *Larval growth, Perch, Pike, Plankton, Roach, Zooplankton.

On the basis of observations of bream, roach, perch, pike-perch and pike juveniles and larvae at different stages of development, 5 periods of

growth characterized by growth intensity and as-sociated with diet were differentiated. There were 2 critical periods for the growth of carp and perch larvae: after yolk resorption and transfer to exter-nal food and during the transfer from a diet of small zooplankton to crustaceous zooplankton.
During these periods the intensity of larval growth
decreased. The second critical period was not applicable to pike.—Copyright 1973, Biological Ab-

A NEW SPECIES OF PSEUDOCODIUM (CHLOROPHYTA, SIPHONALES) FROM THE WEST COAST OF FLORIDA, University of South Florida, Tampa. Dept. of

For primar W73-10470 ary bibliographic entry see Field 05A.

SEASONAL DYNAMICS OF BIOLOGICAL IN-DICES OF ROACH RUTILUS RUTILUS (L.) WITH DIFFERENT FOOD SUPPLIES, (IN RUS-

w State Univ. (USSR). Dept. of Ichthyolo-

gy. T. N. Lyagina. Vopr Ikhtiol. Vol 12, No 2, p 240-257. 1972. Illus. Identifiers: Biological indices, Food (Fish), Indices, *Roach, Rutilus-Rutilus, *Seasonal.

The dynamics of linear growth, weight increase The dynamics of linear growth, weight increase, condition, fatness, relative weight of the liver, and maturity of a single age group from April to Oct. in different years were investigated. The indices depended on food supply. Variation in the first 4 categories was unstable and depended mainly on fattening conditions during a given year. Variation in the hepatic index was consistent and the coefficient of maturity was the same in different years. ently variations in these indices are determined to a large degree by endogenous factors. A sharp increase in food supply during the spring and feeding exclusively on animal food, followed by a sharp deterioration of feeding conditions during a single spawning period led to elimination of some of the eggs. This resulted in a correspondence between the number of developing eggs and the available resources.—Copyright 1973, Biological

DISTRIBUTION OF THE SPAWNING PORTION OF THE SAURY POPULATION COLOLABIS SATRA (BREV.) IN THE PACIFIC OCEAN AND SEA OF JAPAN IN RELATION TO THE TEM-PERATURE OF THE SURFACE WATER LAYER, (IN RUSSIAN), Tikhookeanskii Nauchno-Issledovatelskii Institut

Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR). Yu V. Novikov.

Vopr Ikhtiol. Vol 12, No 3, p 572-576. 1972. Illus. Identifiers: Cololabis-Saira, Distribution patterns (Fish), Ocean, Pacific Ocean, *Saury (Spawning), *Sea of Japan, Spawning, Temperature.

Spawning occurs under about the same hydrological conditions throughout the year. Spawning areas change with the temperature of the water. During the winter the northern portion of the East China Sea and waters off the southern shores of Kyushu, Shikoku and Honshu are areas of group Nyusuu, Shixoku and Honshu are areas of group spawning for saury from the Sea of Japan and Pacific Ocean. In autumn the center moves south, in the spring to the north. Saury inhabiting the Sea of Japan and the waters of East Japan belong to the same stock.—Copyright 1973, Biological Abstracts. Inc. DESICCATION INJURY IN MOSSES: IL THE EFFECT OF MOISTURE STRESS ON ENZYME LEVELS, Manchester Univ. (England). Dept. of Botany.

Identifiers: Acrocladium-cuspidatum, Dehydrogenase, Desiccation, Enzymes, Glutathione, Glyceraldehyde, Moisture, Mosses, NADP, Oxidation, Phosphates, Photosynthesis, Shoots, Sulfhydryl. New Phytol. Vol 71, No 3, p 461-466. 1972. Illus.

The effects of desiccation on the activity of several enzymes from Acrocladium cuspidatum several enzymes from Acrocladium cuspidatum were investigated; with the exception of glyceral-dehyde 3-phosphate dehydrogenase prolonged desiccation had little effect on the enzymes studied. The response of the NADP+-dependent glyceraldehyde 3-phosphate dehydrogenase to sulphydryl compounds changes during desiccation; when extracted from desiccated shoots it showed a 6-20 times simulation of activity in the showed a 6-20 times stimulation of activity in the presence of reduced glutathione, that from fresh shoots showed only a 2-fold stimulation. The effects of glutathione on the enzyme's activity were d in species with varying resista desiccation. It is suggested that the decline in photosynthesis during desiccation may be ex-plained in part by the oxidation of sulphydryl residues essential for the catalytic activity of the NADP+-glyceraldehyde 3-phosphate dehydrogenase. (See also W73-00010)-Copyright 1972, Biological Abstracts, Inc.

DETERMINATION OF TOTAL NITROGEN IN PLANT MATERIALS WITH AN AUTOMATIC NITROGEN ANALYSER, International Atomic Energy Agency, Seibersdorf

For primary bibliographic entry see Field 05A. W73-10530

DESMIDS FROM SOUTHEAST UNITED STATES OF AMERICA, (DESMIDIEEN AUS DEM SUDOSTEN DER VEREINIG STAATEN VON AMERIKA), For primary bibliographic entry see Field 05A. W73-10546 VEREINICTEN

MIGRATION OF STURGEON (ACIPEN-SERIDAE) IN THE VOLGA DURING WINTER, (IN RUSSIAN), Teentralpii Nauchno-Issledovatelskii Institut

Osetrovogo Khozyaistva, Astrakhan (USSR). A. V. Pavlov, and A. P. Slivka.

Vopr Ikhtiol. Vol 12, No 3, p 584-588. 1972. Identifiers: Acipenseridae, Crabs, Invertebrates, Leech, *Migration (Spawning), Parasites, *Sturgeon, *Volga River, Winter.

Studiies of great sturgeon and Russian sturgeon from 1968-70 in different parts of the Volga confirmed the existence of a spawning migration and post-spawning downstream migration during the winter. Under the ice great sturgeon migrated in greater numbers than Russian sturgeon. As oposed to other seasons, the intensity of movement and downstream migration was substantially weaker. Downstream migrants led an active life in wintering areas. As a rule they ate fish, crabs and other bottom-dwelling invertebrates. The rate of infestation with parasites, such as leeches, was lower than in other seasons. Resorption of the eggs during winter in some specimens indicated disorders in the normal process of gonad maturation which developed under new conditions.—Copyright 1973, Biological Abstracts, Inc. W73-10614 CLIMATE AND DEVELOPMENT OF HEL-MINTHS: I. CLIMATOLOGY AND HELMINTH DEVELOPMENT, (IN PRENCH), Ecole Nationale Veterinaire de Lyon (France). Laboratoire de Recherches de la Chaire de Parasitologie.

J. Euzeby. Rev Med Vet (Toulouse). Vol 123, No 5, p 637-655, 1972. English summary. Identifiers: Climates, Climatology, *Helminths, Parasitic worms.

The features of climate are reviewed along with the influence of climate on the exogenous phase of the life cycle of helminths and on the survival of me ne vyce or neiminths and on the survival of free-living stages of these parasites. Some con-sequences of the ability of parasitic worms to in-fect their hosts are presented.—Copyright 1973, Biological Abstracts, Inc. W73-10630

ON THE GEOTROPIC GROWTH OF THE ROOT, (IN GERMAN),

. Kutschera-Mitter. eitr Biol Pflanz. Vol 47, No 3, p 371-436, 1971. Il-

lus. English summary. Identifiers: Evaporation, *Geotropic growth, Humidity, *Root system, Temperature, Water uptake (Plants).

The root systems of perennial plants, being dependent on the changes of soil temperature, are often developed in 3 growth zones, showing varied geotropical behavior in these. Experiments were made with seed plants of various species, and the influence of different temperatures and of different relative air humidity on the geotropic behavior of the plant and the resulting changes in the tissues were observed. The importance of the root can on zeotropism was also investigated, as the tissues were observed. The importance of the root cap on geotropism was also investigated, as well as the influence of the centrifugal force. In order to determine differences in transpiration, the temperatures on the upper and lower sides of horizontally placed moist objects were measured. Previous explanations of geotropism, as the statolith theory or the theory about growth substances are incompatible with the shortness of the induction period. Neither do they explain the great influence of temperature changes on geotropic growth. According to field observations and experiments, the reason for positive geotropic growth of the root is the growth of the elongation zone is dependent on external water and water zone is dependent on external water and water molecules escape faster on the upper side, and the slime of the root cap moves downward so that the cells of the upper side come in contact with the air earlier than those of the lower side. The faster escape of the vapor from the upper side caused by gravity leads to a greater easing of tension of the cell walls, and to cooling due to evaporation. That is why the absorbing power of the cells and the formation of condensed water are greater there normation or concensed water are greater there than on the lower side. In consequence elongation and water uptake of the cells of the upper side are greater. The difference increases with changes in temperature and relative humidity.—Copyright 1973, Biological Abstracts, Inc.

W73-10632

DEPENDENCE OF BLACK FLY LARVAE DIS-TRIBUTION ON THE OXYGEN CONTENT IN THE WATER, THE SPEED OF FLOW AND THE NUTRITIVE VALUE OF WATER STREAMS,

(IN RUSSIAN),

Ivanovskii Gosudartsvennyi Meditsinskii Institut
(USSR). Dept. of Biology.

L. A. Ivashchenko.

L. A. Ivasachenso. Med Paraziol Parazit Bolezn. Vol 41, No 2, p 217-220, 1972. English summary. Identifiers: "Black fly larvae, Distribution, Lar-vae, Nutritive value, "Oxygen, Streams.

Dispersal of larvae of black flies of different species depends upon the extent of water saturation with O2, rate of flow, biological requirement of

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water in O2, and nutritive value of the water stream. The nutritive value of the stream was determined as the value resulting from multiplying by the rate of flow of the water. Species selectivity by all these values characterizing the biotope was observed. The definite correlation between the density of larvae, rate of flow, and nutritive value of the stream was observed only in biotopes of similar types or in different parts of the same water stream.—Copyright 1973, Biological Abstracts. Inc.

SCALE STRUCTURE OF THE AMUR KETA ONCORHYNCHUS KETA (WALB.) AS AN INDEX OF GROWTH AND LIVING CONDI-TIONS DURING THE FRESHWATER STAGE OF LIFE, (IN RUSSIAN), Tikhookeanskii Nauchno-Issledovatelskii Institut

Rybnogo Khozyalistva i Okeanograpii, Khabarovsk (USSR). Lab. of Anadromous Sal-

Yu S. Roslyi

Yugr Ikhtiol. Vol 12, No 3, p 532-544. 1972. Illus. Identifiers: *Amur Keta, Growth (Fish), Oncorhynchus-Keta, *Scale structure (Fish).

The effects of the river current on the growth of Amur keta during the early part of the first year of life was considered. Differences in the number of sclerites in the first annual growth zone of the scale suggested a link between keta growth in the first year and living conditions during the fresh-water period. In years of low flow rates during the downstream migration period, keta juveniles grew better in the rivers and brackish littoral waters.— Copyright 1973, Biological Abstracts, Inc. W73-10642

SEASONAL FLUCTUATIONS IN THE WATER CONTENT OF VARIOUS PLANT FORMA-TIONS IN HAUTE-ARDENNE, Louvain Univ. (Belgium). Laboratoire d'Ecologie

Vegetale. C. Renard

Mem Soc R Bot Belg. 5, p 5-139. 1971. Identifiers: "Beech, "Belgium (Haute-Ardenne), Bogs, Forests, Meadow, Norway, Regulation, "Seasonal, "Spruce, Yield.

Four plant communities (beech forest, Norway spruce plantation, meadow, bog) were studied in the 'Plateau des Tailles' (600 m above sea level, Belgian 'Haute-Ardenne'). The 4 communities were studied from a phenological point of view. At the same time, samples were collected in the beech forest and in the spruce plantation, from Jan. 1965 to May, 1966. From these, trends of water content variations during the year (for different plant parts) and dry weight (for some plant parts, only) were obtained. In both cases, the average water weight was the greatest during the winter, and the smallest during the period of active growth. From a detailed analysis of the variations of that parameter, it can be concluded that the older plant parts (heartwood) are water refilled during the winter. The meadow and the bog were studied from June, 1966 to Oct., 1967. Mean dry biomasses (tons/ha) and water contents were estimated. Water content was the greatest in winter, and the smallest during active growth. Dry biomass and water contents of the 4 stands were calculated at 4 characteristic times of the year. The differences between the annual maximum and minimum water contents, expressed in water height, is 2.5 mm for the meadow, 3.4 mm for the beech forest 6.4 mm for the spruce plantation, and 12.4 mm for the bog vegetation. The times at which the maxima and minima were obtained emphasize the importance of the bog for water yield regulation.—Copyright 1973, Biological Abstracts, Inc. STRATIFICATION OF TROPICAL EPIPHYLLS,

Florida Technological Univ., Orlando. Dept. of Biological Sciences. Don R. Reynolds. Kalikasan Philipp J Biol. Vol 1, No 1, p 7-10. 1972. Identifiers: *Costa-Rica, Environmental studies, *Epiphylls (Tropical), Moisture, *Stratification, Tropical.

Epiphylls in a Costa Rican rain forest exhibited a definite stratification. The vertical variance was correlated with environmental factors, the most important of which was available moisture.—Copyright 1973, Biological Abstracts, Inc. W73-10645

INSECT-PRODUCTION OF BLOOD-SUCKING MOSQUITOES CULEX PIPIENS L. AND ALLOTHEOBALDIA LONGIAREOLATA MACQ. IN SHOWER INSTALLATIONS UNDER CONDITIONS OF A HOT CLIMATE, (IN RUSSIAN), V. L. Kulanin.

V. L. Kulanin.
Med Parazitol Parazit Bolezn. Vol 40, No 5, p 622623. 1971. English summary.
Identifiers: Allotheobaldia-Longiareolata, Climates (Tropical), Culex-Pipiens, *Insect production, Installations, *Mosquitoes.

Additional water bodies suitable for breeding consist of showers (barrels, tanks), refuse and sewer pits, water supply manholes and sewer systems, and temporary lavatories. These additional water bodies should be regularly examined, since they are sometimes the main sources of A. longiarcolata and C. pipiens mosquitoes in towns with hot climates. Recommendations are given for private persons and organizations to prevent mosquito breeding in such water bodies.—Copyright 1973, Biological Abstracts, Inc. W73-10647.

BREEDING PLACES OF MOSQUITOES IN THE AREA OF THE OERTZE LOWLAND (LUEN-BURGER HEIDE: 1. BREEDING PLACES OF AEDES PUNCTOR KIRBY,

E. Ising.
Zool Beitr. Vol 17, No 2/3, p 435-456. 1971. Illus.
Identifiers: Aedes-Punctor, *Breeding, Lowlands,
*Mosquitoes, Places, *Germany (Oertze

In 1969 and 1970, 30 breeding waters of Aedinae, all containing A. punctor, were observed in the Oertze Lowland (West Germany). Of these, 7 waters contained 8-90% A. punctor, while 23 others contained 8-90% A. punctor larvae in association with A. excrucicans, A. annulipes, A. cinereus and/or A. communis. The breeding waters are precipitation pools or puddles existing from several wk to about 4 mo. A considerable number of the waters are very similar to peat waters with reference to location, meterological and geophysical conditions of the location, depth, temperature and composition of the water and vegetation. Analysis of breeding behavior of A. punctor in the investigated area and data from literature show that its acidophila is not species-specific and is not suitable for characterization of its preference behavior. Classification of A. punctor as a tyrphophilic species (living on peat) is supported by occasional authochthonous forest populations.—Copyright 1973, Biological Abstracts, Inc. W73-10648

EFFECTS OF HEAVY TENDING TREATMENTS ON THE MICROCLIMATE IN YOUNG CROPS Brno (C-

OF SPRUCE, (IN CZECH), Vysoka Skola Zemedelska, l zechoslovakia). Faculty of Agronomy. M. Novakova

Acta Univ Agric Fac Silvic. Vol 40, No 3, p 187-200. 1971. Illus. English summary.
Identifiers: Climates, Crops, Evaporation,
Forests, Humidity, Microclimate, Soils, *Spruce,
Temperature, *Tending treatments.

The plants examined were exposed separately to heavy, moderate, and zero tending treatments. Comparisons were made of the values measured in the separate treatments for light, soil temperature determined at 2 and 5 cm depths, air temperature measured at 5 and 150 cm above the soil surface, temperature amplitudes, relative humidities at 5 and 150 cm above the soil surface, and evaporation.—Copyright 1973, Biological Abstracts, Inc. W73-10649

STUDY OF THE STATE OF WATER AND WATER EXCHANGE OF A PLANT CELL BY IR ABSORPTION SPECTRA, (IN RUSSIAN), Kazan State Univ., (USSR).
For primary bibliographic entry see Field 07B. For primar W73-10702

LEAF DIFFUSION RESISTANCE TO WATER VAPOUR AND ITS DIRECT MEASUREMENT: I. INTRODUCTION AND REVIEW CONCERNING RELEVANT FACTORS AND METHODS, Agricultural Univ., Wageningen (Netherlands). Lab. of Physiological Meteorology. For primary bibliographic entry see Field 07B. W73-10703

AN EVALUATION OF THE POSSIBLE EF-FECTS OF WATER DIVERSION OF THE CON-NECTICUT RIVER ON THE BIOLOGY OF ANADROMOUS FISH IN THE RIVER,

ANADROMOUS FISH IN THE RIVER,
Massachusetts Univ., Amherst.
J. A. McCann, and E. R. McGrath.
In: Formation of Public Policy on Issue of Out-ofState Basin Diversion of Connecticut River Flood
Waters to Boston Metropolitan Area, Massachusetts Water Resources Research Center,
Publication No. 25, 1973. Appendix C, 14 p, 47 ref.
OWRR C-2169 (No.3377) (1).

Descriptors: *Diversion, *Environmental effects, *Anadromous fish, Fish migration, *Pumped storage, *Connecticut River, *Inter-basin trans-

Identifiers: *Flood water diversions, American shad, Atlantic salmon, Sea lamprey, Blueback her-

ring, Alewife.

The possible effects of the flood water diversions, including the operation of a pumped storage facility on Northfield Mountain, on anadromous fish in the Connecticut River is discussed. The fish under consideration are the American shad, blueback herring, alewife, sea lamprey, and Atlantic salmon. The influences and relationships involved are very complex but two key factors are water flow and temperature. In particular, the upstream migration of the American shad and the Atlantic salmon are closely related to spring and fall flood water conditions. These flood flows would be altered by the proposed diversions but probably not enough to affect the migration. On the other hand increased diversions or diversions during normal flows may have significant effects. Also, in the vicinity of the intakes, there may be problems due to the periodic reversal of flows and the loss of fish into the intakes. It is recommended that studies be made at the existing facilities at Holyoke Dam to relate flood flow reduction and other factors to the passage of fish over the dam. (See also W73-10726). (Effers - North Carolina). W73-10729

THE EFFECTS OF HUMIC ACID ON THE GROWTH AND DIGESTIBILITY IN FISH FED BROWN FISH MEAL AND SOYBEAN MEAL DIETS, (IN JAPANESE), Freshwater Fisheries Research Lab., Tokyo

(Japan). Y. Satomi, and H. Tanaka. Y. Satomi, and H. I anaka. Bull Freshwater Fish Res Lab Tokyo. Vol 21, No 2, p 179-195. 1971. Illus. English summary. Identifiers: Diets (Fish), Digestibility, Fish meal, *Growth, *Humic acid, Soybean meal.

In most cases, fish fed test diets showed nearly an most cases, fish fed test diets showed nearly equal or slightly better growth when compared with control fish fed commercial diet although the average body weight gain on test diets were inferi-or to those of the control diet.—Copyright 1973, Biological Abstracts, Inc. W73-10804

A PURIFIED TEST DIET FOR THE EEL, ANGUILLA JAPONICA, Freshwater Fisheries Research Lab., Tokyo

(Japan).
S. Arai, T. Nose, and Y. Hashmioto.
Bull Freshwater Fish Res Lab Tokyo. Vol 21, No
2, p 161-178. 1971. Illus.
Identifiers: Anguilla-Japonica, *Diets, *Eel, Purified test diet.

Attempts were made to establish a purified test diet which fulfills the nutritional requirements of eel, by modifying the test diet devised by Halver (1937) for salmoids. As fat source, corn oil, cod (1957) for salmoids. As fat source, corn oil, cod liver oil and their mixture in 2:1 were tested at a 12% level in the diet. The mixed oil was the most favorable for growth and cod liver oil the least. Eels fed on a corn oil diet which is scanty in linolenic acid showed a fatty acid pattern characterized by the absence of highly unsaturated fatty acids supposed to be derived from linolenic acid. The level of mineral mixture was an important factor for growth. The eel, kept on diets either con-The level of mineral mixture was an important factor for growth. The eel, kept on diets either containing 1% mineral mixture or lacking it, showed cessation of growth in 2 wk, followed by both loss of their body weight and high mortality. All the dead fish revealed scoliosis and lordosis. The higher the level of mineral mixture, the better was the growth. At a level as high as 8%, the body weight gain was maximum. As supplement, a combination of 0.5% L-tryptophan and 1% L-cystine was much better than that of 0.5% L-tryptophan and 1% DL-methionine. A further addition of 0.5% and 1% DL-methionine. A further addition of 0.5% L-threonine, however, depressed growth remarkable, suggesting the importance of amino acid balance in protein nutrition of eel. A purified test diet consisting of casein 54, gelatin 15, dextrin 8, corn oil 6, cod liver oil 3, cellulose power with vitamin mixture 6, mineral mixture 7, L-tryptophan 0.5, L-cystine 1 and water 200 maintained the much improved growth for 14 wk without inducing any abnormality in eels.—Copyright 1973, Biological Abstracts, Inc. W73-18005. nd 1% DL-methionine. A further additi on of 0.5%

DESERT PRODUCTIVITY AND ITS DYNAMICS IN CONNECTION WITH METEOROLOGY, (IN

A. P. Fedoseev. Probl Osvoeniya Pustyn'. 3. p 3-9. 1972. Illus. En-

glish summary.

Identifiers: Computers, *Deserts, Dynamics, Forecasting, Meteorology, Productivity, Range, Yield.

Prognostication of range plant yield includes forecast of meteorological and biological phenomena. Biological regularities are, mainly, expressed by nonlinear correlation. Thus, together with methods of statistic forecast in agrometeorological forecasting, the nonlinear correlation should be used. Of great help is the utilization of computers and programmed development of forecasting models. Prospective yield prognostication is possible with the mathematical model 'weather yield,' the structure of which expresses correlation between hydrometeorological conditions and vital activity of plants-photosynthesis, respiration, growth and development.—Copyright 1973, Biological Abstracts, Inc. W73-10808

COMPARATIVE STUDY OF THE PLAGIOTHECIACEAE OF BELGIUM WITH REGARD TO CERTAIN FACTORS INFLUENCING THEIR WATER RELATIONSHIPS WITH THE ENVIRONMENT, (IN FRENCH), Namur Univ. (Belgium). Dept. of Botany.

J. Lefebvre.

J. Lefebvre.

Bull Soc R Bot Belg. Vol 103, No 1, p 63-70. 1970.

Blus. English summary.

Identifiers: "Belgium, Isopterygium, "Oamotic potential, "Plagiotheciaceae, Plagiothecium-Curvifolium, "Plagiotheciam-Denticulatum, Plagiothecium-Denticulatum-Var-Denti, Plagiothecium-Denticulatum-Var-Undul, Plagiothecium-Undulatum, Sap, Taxonomy, Turgidity, Vacuolar, Water loss.

The principal species of Belgian Plagiotheciaceae were studied with respect to 4 characters related to water economy: osmotic potential of vacuolar sap, relative turgidity, water-content of fresh amples, and rate of water-loss. Data on water relations is used to supplement other data concerning the tax-nonmy of Isopterygium and Plagiothecium, P. undulatum and other Plagiothecium as., and P. leatum and P. curvifolium. Similarity of osmotic potential parameters justifies retention of P. denticulatum var. denticulatum and var. undulatum in the same species.—Copyright 1973, Biological Abstracts, Inc. W73-10811

DENSITY GRADIENT CENTRIFUGATION AS AN AID TO SORTING PLANKTONIC ORGAN-ISMS: I. GRADIENT MATERIALS, Marine Biological Lab., Woods Hole, Mass. R. A. Bowen, J. M. St. Onge, J. B. Colton, Jr., and C. A. Price.

Mar Biol (Berl). Vol 14, No 3, p 242-247. 1972. Il-

lus.

Identifiers: *Centrifugation (Density gradient),
Fish eggs, Invertebrates, Marine organisms,
*Plankton, Salpa, *Sorting, Zooplankton.

Fish eggs and larvae can be separated from inver-tebrate zooplankton by centrifugation in gradients of sucrose or silica. Preserved samples of inver-tebrate zooplankton, fish eggs, and fish larvae, representing a typical assortment of marine plant-ton, were layered over linear gradients of 25 to 60% w/w (weight) sucrose or 0 to 15% w/w silica (as Ludox AM) in 100 c3 swinging buckets and centrifuged for 1 hr at 1000 rpm (revs per min). In sucrose gradients, the invertebrate zooplankton were confined to the 2 ends of the gradient, while 85% of the fish eggs were recovered from an intermediate zone (27.5 to 55% w/w). In Ludox AM, mediate zone (27.5 to 55% w/w). In Ludox AM, the fish eggs banded in a narrow region between 2 and 3% w/w, while fish larvae banded at the bottom of the gradient between 10 and 14% w/w. Of the 6 dominant classes of zooplankton, only Salpa overlapped appreciably with the fish larvae. Of the gradient materials tested, Ludox AM offers the most advantages; sucrose may also be useful for subfractionation. Gradients of sodium bromide and dextran have been found to be totally unsuitable.—Copyright 1973, Biological Abstracts, Inc. W73-10813

STUDIES ON THE CARP CULTURE IN RUNNING WATER POND: V. OXYGEN SUPPLY AND CONSUMPTION IN THE FISH POND AND ESTIMATION OF THE AMOUNT OF HARVESTABLE FISH IN A POND, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo

Bull Freshwater Fish Res Lab Tokyo. Vol 21, No 2, p 151-160. 1971. Illus. English summary. Identifiers: "Carp, Culture, Fish, Harvestable fish, "Oxygen, Ponds.

Oxygen consumption rate of carp (50-130 g) in active condition was measured under various water temperatures (16-30 C). The relation between oxygen consumption rate (Y) and water temperature (X) is expressed by the following formula: logY ± 0.0307X + 1.4072. Oxygen consumption rate of pond water varied from 0-0.24 cc/1. No clear diurnal changes were observed. Oxygen values obtained from other areas are compared. Seasonal

variations and the ratio of average fish weight at harvest to that at maximum temperature are in-dicated. (See also W72-07700)-Copyright 1973, Biological Abstracts, Inc. W73-10815

2J. Erosion and Sedimentation

METHODS OF MEASURING MASS WASTING; REVIEW AND CRITIQUE, Portland State Univ., Oregon. L. W. Price, and C. S. Alexander. Proceedings of the Association of American Geographers, Vol 3, p 135-139, 1971. 34 ref.

Descriptors: "Mass wasting, "Erosion, "Slopes, Movement, Measurement, Analytical techniques, Erosion rates, Creep, Avalanches, Landslides, Mudflows, Rockslides, Mass transfer, Strain gages, Instrumentation. Identifiers: "Mass wasting meter, Radioactive devices, Young pit, Vertical velocity column.

The use of more precise and better controlled methods of measuring mass wasting is presented. In situ rocks, small pins, dowels, and cone targets are better devices for measuring surface movement than are wooden stakes. Methods for moniment than are wooden stakes. Methods for moni-toring movement with depth include: the Young pit, vertical velocity column, mass wasting meter, radioactive devices, and strain gauges. The latter two show the greatest promise. The value and sig-nificance of field measurements in geomorphology are limited by the techniques used. (Woodard-USGS) W73-10422

RECONNAISSANCE OF CHEMICAL QUALITY OF SURFACE WATER AND FLUVIAL SEDI-MENT IN THE PRICE RIVER BASIN, UTAH, Geological Survey, Salt Lake City, Utah. For primary bibliographic entry see Field 02K. W73-10423

SEDIMENT TRANSPORT BY STREAMS DRAINING INTO THE DELAWARE ESTUARY, Geological Survey, Philadelphia, Pa. For primary bibliographic entry see Field 02L. W73-10425

TIDAL CURRENT ASYMMETRIES OVER THE NORFOLK SANDBANKS, Cambridge Univ., (England). Dept. of Applied Mathematics and Theoretical Physics. For primary bibliographic entry see Field 02E.

THE SIGNIFICANCE OF WAVE PARAMETERS IN THE SORTING OF BEACH PEBBLES, Unit of Coastal Sedimentation, Taunton (England). R. Gleason, and P. J. Hardcastle.

Estuarine and Coastal Marine Science, Vol 1, No 1, p 11-18, January 1973. 6 fig, 1 tab, 19 ref.

Descriptors: *Sediment sorting, *Beaches, *Gravels, *Surf, *Littoral drift, Waves (Water), ediment transport, Sedimentation, Particle size, limentology. ntifiers: Chesil Beach (England).

On Chesil Beach, Dorset, England, longshore drift sorting is dependent on the angle of swell ap-proach and wave height. The vertical sorting is deproach and wave height. The vertical sorting is de-pendent on the wave frequency and wave height. The processes are reflected most significantly in the mean short diameters of the pebbles. Chesil Beach is a graded shingle structure approximately 18 km long with mean pebble long diameter in-creasing from 1.5 cm at West Bexington to 5.5 cm at Chesilton. The grading is linear over much of its

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length but increases exponentially over the eastern 5 km. In the area under discussion the whole of the beach above low water mark is composed of material of pebble size or above although finer fractions are sometimes present at or below low water mark. (Knapp-USGS) W73-10431

THE EVOLUTION OF LEWES HARBOR,

THE EVULUTION OF LEWES HARBOR,
Delaware Univ., Newark. Dept of Geology.
J. C. Kraft, and R. L. Caulk.
Available from NTIS, Springfield, Va. 22151 AD753 860. Price \$3.00 printed copy; \$0.95
microfiche. Delaware University College of
Marine Studies Technical Report No 10,
November 1972. Sp., 22 fig, 14 ref. ONR-GP Contract N00014-69-A0407.

Descriptors: *Coasts, *Harbors, *Sedimentation, *Sediment transport, *Delaware, Erosion, Sedimentation rates, Breakwaters, Sand spits, Geomorphology, Environmental effects, Ocean currents, Shores, Littoral drift. Identifiers: *Lewes Harbor (Del)

Lewes Harbor, Delaware, is being destroyed by silting and erosional processes. In addition, the effectiveness of the Harbor of Refuge has become fectiveness of the Harbor of Refuge has become more limited, in part by processes in coastal change and in part by changes in the nature of shipping patterns. Short term projection of changes in coastal morphology indicates that Cape Healopen will join the inner breakwater of Lewes Harbor in the short term future. With this event, the complete silting of the inner harbor should occur. Ultimately, over the next century, the present inner harbor of Lewes should become a shallow tidal flat bordered by a coastal marsh. Over the long term (3 to 500 years) period a contining erolong term (3 to 500 years) period a contining ero-sion of the Atlantic shore will cause the Atlantic shoreline area to merge with the inner Delaware breakwater. Further intrusion of man into this area may drastically alter these predictions. (Woodard-TISGS) W73-10438

A TWO-LAYER MODEL OF MUD TRANSPORT IN THE THAMES ESTUARY, Hydraulics Research Station, Wallingford (En-

gland). For prin ary bibliographic entry see Field 02L. W73-10443

THE LIMNOLOGY OF STOCKBRIDGE BOWL, STOCKBRIDGE, MASSACHUSETTS, Massachusetts Univ., Amherst. Dept. of Zoology. For primary bibliographic entry see Field &C.

EFFECTS OF URBANIZATION OF SEDIMEN-TATION AND FLOODFLOWS IN COLMA CREEK BASIN, CALIFORNIA, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 04C.

ACCUMULATION OF FALLOUT CESIUM 137 IN SOILS AND SEDIMENTS IN SELECTED WATERSHEDS, Agricultural Research Service, Oxford, Miss.

Sedimentation Lab. For primary bibliographic entry see Field 05B.

FATE OF SUSPENDED SEDIMENT DURING

BASIN RECHARGE,
Southwestern Great Plains Research Center,
Bushland, Tex. D. W. Goss, S. J. Smith, B. A. Stewart, and O. R.

Water Resources Research, Vol 9, No 3, p 668-675, June 1973. 2 fig, 4 tab, 28 ref.

Descriptors: "Suspended load, "Artificial recharge, "Recharge ponds, Sedimentation, Silts, Silting, Desilting, Infiltration, Pit recharge, Tracers, Clays. *Artificial

Suspended sediment was tagged with the radioisotope Cs-134 to determine the extent of its movement into materials underlying recharge basins and to aid in evaluating the effect of its accumulation on infiltration rates and the basin life. When openings of naturally occurring large pores were allowed to remain at the basin surface, 50% of the sediment moved deeper than 18 inches. However, when large-pore openings at the surface were destroyed by cultivation, over 90% of the suspended sediment was retained in the upper 1 inch. Most of this sediment could easily be removed. The suspended sediment that moved deeper than about 0.15 inch (the depth removed after each recharge cycle) did not noticeably reduce infiltration rates in an experimental basin. (Knapp-USGS) (Knapp-USGS) W73-10668

COASTAL EROSION IN THE NILE DELTA United Nations Educational, Scientific and Cul-tural Organization, New York. Ev Nielsen.

Nature and Resources, Vol 9, No 1, p 14-18, January-March 1973. 1 fig, 1 ref.

Descriptors: "Soil erosion, "Coasts, "Deltas, *Sediment control, *Africa, Flood plains, Erosion control, River basins, Planning, Programs, Dams, Reservoirs, Environmental effects, Streamflow, Sediment transport, Project purposes, Data collec-

Identifiers: *Nile delta (Africa), Egypt.

Following the planning and the construction of the Aswan High Dam, closed off in 1964, Egyptian scientists have had to consider the question of the nature and scope of the changes to the Nile valley and to the Nile delta and its shores, that would result from impounding the seasonal Nile flood waters with their sediment load in the dam reservoir (Lake Nasser). The objective of the present phase of the project, approved by the United Nations Development Program, is to assist the government in carrying out a comprehensive scientific study of the causes of coastal erosion the Nile delta area, and in the preparation of a plan scientific study of the causes of coastal erosion in the Nile delta area, and in the preparation of a plan for coastal protection works, including recommendations for design and construction. Operations to be carried out by the project will provide for: (a) a detailed description of the Nile delta shore in terms of geography, geology, morphology as well as hydraulic, littoral drift and erosion conditions; and (b) on the basis of evaluation of the data, recommendations for the design and construction of the required coastal protection works. (Woodard-USGS) W73-10681

ANNOTATED BIBLIOGRAPHY AND COM-MENTS ON SEDIMENTATION IN THE CON-

MENTS ON SEDIMENTATION IN THE CON-NECTICUT RIVER, Vermont Univ., Burlington. D. P. Fay, and R. N. Downer. In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area, Mas-sachusetts Water Resources Research Center, Publication No. 25, 1973, Appendix B, 1 fig, 19 p, 41 ref. OWRR C-2169 (No 3377) (1).

Descriptors: *Sedimentation, *Bibliographies, Deposition, Sediment load, Erosion, Urbanization, Environmental effects, *Connecticut River, *Diversion, *Inter-basin transfers.

It is evident from this literature survey that there is very little quantitative data on sedimentation in the Connecticut River basin. This is partly due to the fact that the Connecticut River bed is quite stable and has not experienced excessive sediment

deposits. Also, although there has been rapid urbanization in localized areas within the basin, the general trend in the basin is toward reforestation and thus reduction in sediment production. The report recommends, however, that (1) certain special areas such as river bends and urbanizing tributaries should be studied; (2) that at least one sediment load station should be established on the main stem of the river; and (3) that where historic data is available on cross-sections and reservoirs these areas should be surveyed again and periodically in the future. Sediment transport data from four tributary streams are plotted on a graph. (See also W73-10726). (Elfers-North Carolina).

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SHAPE AND NATURE OF SMALL SEDIMEN-OFFIGER AND NATURE OF SMALL SEDIMENTARY QUARTZ PARTICLES, Queens Coll., Flushing, N.Y. Dept. of Earth and Environmental Sciences. D. H. Krinsley, and I. J. Smalley. Science, Vol 180, No 4092, p 1277-1279, June 22, 1973. 4 fig, 7 ref.

Descriptors: "Quartz, "Sediments, "Particle shape, "Particle size, "Petrofabrics, Sedimentology, Sedimentation, Sedimentary structures, Loess, Clays, Silts.

Small quartz particles in sediments are almost al-ways shaped like flat plates. Also, they are almost invariably produced by breakage, attrition from larger particles. This suggests that a cleavage mechanism operates in quartz when the particle size is reduced below a critical value. This critical size may be on the order of 100 micrometers. This cleavage may occur on the (0001) planes (c planes). (Knapp-USGS) W73-10742

SHELF SEDIMENT TRANSPORT: PROCESS

AND PATTERN.
Dowden, Hutchinson and Ross, Inc., Stroudsburg nsylvania, D. J. P. Swift, et al, editors, 1972.

Descriptors: *Sediment transport, *Ocean currents, *Continental shelf, *Currents (Water), *Waves (Water), Surf, Turbulence, Sedimentation, Sedimentalology, Distribution patterns.

This volume contains papers presented in a symposium on shelf sediment transport conducted at the annual meeting of the Geological Society of America held in Washington, D.C., November 1971. Several papers not delivered at the symposium were added to broaden the scope. The three sections of the book are concerned with shelf hydraulic regime and mechanics of sediment transport, suspended sediment dispersal, and bottom sediment dispersal. The goal of assembling these papers was to document some fundamental aspects of the shelf milieux and its sediment dispersal systems, to indicate the nature and scope dispersal systems, to indicate the nature and scope of present knowledge and the direction of ongoing or present knowledge and the direction of ongoing research, and to provide some perspective on the problems associated with understanding, deter-mining, and predicting sediment transport on con-tinental shelves. (See also W73-10747 thru W73-10773) (Knapp-USGS) W73-10748

AN INTRODUCTION TO OCEANIC WATER MOTIONS AND THEIR RELATION TO SEDI-MENT TRANSPORT, Army Coastal Engineering Research Center, Washington, D.C.
J. R. Weggel.
In: Shelf Sediment Transport: Process and Pat-

tern; Dowden, Hutchinson and Ross, Inc., Strosburg, Pennsylvania, p 1-20, 1972. 5 fig, 12 ref.

Descriptors: *Sediment transport, *Ocean currents, *Continental shelf, *Currents (Water),

Erosion and Sedimentation—Group 2J

*Waves (Water), Surf, Turbulence, Sedimenta-tion, Sedimentology, Distribution patterns.

ton, Sedimentology, Distribution patterns.

A brief discussion of those aspects of flow important in sedimentation studies is presented as an introduction to discussion of the physical principles governing fluid flows. Examples of how these principles manifest themselves in the oceans, the assumptions made in simplifying the governing equations, and in some cases how the flow is related to sediment movement, are presented. Wave motions, particularly wave-induced near-bottom velocities, are discussed with regard to their increasing ability to agitate bottom materials as waves move shoreward across the continental shelf. Ocean currents also provide a mechanism for transporting marine sediments. Examples of observed current phenomena and the assumptions made to simplify the governing equations are presented. The deflection of wind driven turbulent currents caused by Coriolis effects results in the presented. The deflection of wind driven turbulent currents caused by Coriolis effects results in the well-known Ekman spiral. Ekman's result for deep water is given. The important implication for shelf sediment transport studies is that care must be exercised in extrapolating surface wind and current observations to the near-bottom currents that are important in moving sediments. (See also W73-10746) (Knapp-USGS) W73-10747

WAVE BOUNDARY LAYERS AND THEIR RELATION TO SEDIMENT TRANSPORT, Army Coastal Engineering Research Center, Washington, D.C. Washington, D.C. P. G. Teleki.

P. G. Teieki.
In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 21-59, 1972. 15 fig, 81 ref.

escriptors: *Sediment transport, *Contin shelf, *Surf, Waves (Water), Ocean waves, Ocean currents, Littoral drift, Erosion, Boundary layers, Turbulent flow, Turbulence, Unsteady flow, Sedi-Identifiers: *Oscillating flow.

Sediment transport in the ocean is examined from the viewpoint of oscillating flows. Principles of both steady and unsteady boundary layers are reviewed. In the potential flow region the forcing function is represented by the combined effect of waves and currents. This paper is concerned mainly with the effects of waves. A unifying mainly with the effects of waves. A unifying theory for energy dissipation and sediment transport under shoaling, breaking, and transformed waves does not exist because the nonlinearity present in wave motion and in turbulence has not been appraised. Study of the response function (sediment motion) can be conducted more efficiently through research on boundary layers in oscillating flows. Relationships for the distribution of velocity and shear stress in periodic flows are dependent on the characteristic frequency and amplitude of oscillation. Shear stress measurements show increasing magnitude shoreward, outside the show increasing magnitude shoreward, outside the zone of breaking waves. There is no adequate theory for the mechanics of energy dissipation and sediment motion in the region of shoaling, breaking, and broken waves. Consequently, the assumption of wave energy conservation up to wave breaking is one to responsible sequential increase. breaking is open to reappraisal because it ignores the physical evidence presented by tracer experiments of sediment moving offshore of the breaker zone. (See also W73-10746) (Knapp-USGS) W73-10748

PREDICTING INITIAL MOTION AND BEDLOAD TRANSPORT OF SEDIMENT PARTICLES IN THE SHALLOW MARINE EN-

VIRONMENT, Washington Univ., Seattle. Dept. of Oceanog-

raphy.

R. W. Sternberg.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroud-

sburg, Pennsylvania, p 61-82, 1972. 26 fig, 1 tab, 25 ref. AEC AT-45-1-2225 TA 21-1, NSF GA 28964.

Descriptors: *Sediment transport, *Continental shelf, *Surf, Waves (Water), Ocean waves, Ocean currents, Littoral drift, Erosion, Boundary layers, Turbulent flow, Turbulence, Unsteady flow, Sedi-

Boundary-layer and sediment-transport measurements from the marine environment were used to develop a procedure for predicting grain movement for sand-sized particles over the sea floor. Given a knowledge of sediment texture and mean velocity one meter from the seabed it is possible to estimate the boundary-shear stress, predict the initiation of grain movement, and estimate the mass transport of sediment as bedload. The Bagnold bedload equations are used for the bedload transport predictions, modified to fit the results of oceanographic field experiments. The advantages of this procedure are its simplicity with respect to the independent variables (mean velocity and sediment size) and that every step in the technique was developed from field measurements; bence, it is specially suited for application in the marine environment. (See also W73-10746) (Knapp-USGS) W73-10749

EXPERIMENTS ON BOTTOM SEDIMENT MOVEMENT BY BREAKING INTERNAL

WAVES,
Massachusetts Inst. of Tech., Cambridge. Dept. of
Earth and Planetary Sciences.
J. B. Southard, and D. A. Cacchione.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 83-97, 1972. 11 fig, 14 ref.
ONR Contract N00014-67-40204-0048.

Descriptors: *Internal waves, *Sediment transport, *Gravity waves, *Continental shelf, Thernocline, Interfaces, Waves (Water), Ocean waves, Thermal stratification, Hydraulic models, Model studies, *Bottom sediments.

Identifiers: Breaking internal waves.

Bottom-sediment movement produced by oceanic internal gravity waves as they shoal on the continental shelf or upper slope were studied over a planar sloping bottom mantled with lightweight acrylic sediment using a two-layer fluid medium in a large wave tank. The waves break abruptly as they shoal, producing a breaker in the form of a turbulent and rapidly dissipating vortex. There is a compensating return flow of mixed fluid along the bed between breakers. Sediment is moved upslope by the breakers, partly in suspension, and downslope by the return flow, as bedload. Predominant flow at the bed and therefore also net sediment transport are downslope. Sediment Predominant flow at the bed and theretore asso net sediment transport are downslope. Sediment movement is strongest just upslope of the point of breaking and decreases to zero gradually upslope and sharply down slope. Sediment ripples form and migrate downslope toward the point of breakand snarply down slope. Sediment ripples form and migrate downslope toward the point of breaking despite disruption by each breaker. There is a broad band of slow net erosion upslope and a narrower band of more rapid net deposition near the point of breaking. (See also W73-10746) (Knapp-USGS)

WAVE ESTIMATES FOR COASTAL REGIONS. Army Coastal Engineering Research Center, Washington, D.C. D. L. Harris.

D. L. Harris. In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 99-125, 1972. 16 fig, 4 tab, 34 ref.

Descriptors: "Waves (Water), "Data collections, "Surf, "Coasts, "Continental shelf, Aerial photog-raphy, Instrumentation, Time series analysis, Frequency, Frequency analysis, Wavelengths,

Significant information about wave climate can be obtained from aerial photographs and instrument records, visual observations, and wave hindcasts based on weather charts. Estimates of wave-height data from all of these are reasonably well correlated. Observations of wave period are considerably less astisfactory. Aerial photographs and spectral analysis of instrument records indicate that two or more wave trains with distinct periods are generally present; however, visual observations and most manual analyses of instrument records give only one wave period for each observation. This is largely the result of a tendency by observers to assign a single value to the wave period even though several distinct periods are important. In addition, reported values of wave period from shipboard generally give little indication of the period experienced near the beach. This results both from masking of long period waves by short period seas, and from peaking up of long period waves in the breaker zone. (See also W73-10745) [Knapp-USGS]

OBSERVATIONS ON WIND, TIDAL, AND DEN-SITY-DRIVEN CURRENTS IN THE VICINITY OF THE MISSISSIPPI RIVER DELTA, Louisiana State Univ., Baton Rouge. Coastal Stu-

dies Inst.

dies inst.
S. P. Murray.
In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p. 127-142, 1972. 8 fig. 1 tab, 13 ref. ONR-GP Contract N00014-69-A-0211-0003.

Descriptors: *Currents (Water), *Continental shelf, *Deltas, *Mississippi River, Winds, Water circulation, Density currents, Tides. Identifiers: *Mississippi Delta.

Variation with depth of currents and water density were studied in 15 m of water east of the Mississip-pi River delta for 5 days in March 1970. After a tidal current was isolated and removed, the tidal current was isolated and removed, the residual current data were closely correlated with winds and density gradients. Wind effects are of great importance to current structure on the shelf east of the Mississippi River delta. When wind speeds exceed about 20 knots from the southeast-erly quadrant, currents driven directly by the wind, in combination with slope currents described by wind setup against the coast wind, in combination with slope currents generated by wind setup against the coast, produce vertical circulation patterns with onshore flow in the surface waters and offshore flow in the bottom waters. Density structure and the redistribution of mass by winds can alter and even reverse the velocity field produced by the wind effects. After a southeasterly storm, strong south to southwesterly currents persist for several days, producing a relatively stable current. (See also W73-10746) (Knapp-USGS) W73-10752

SEDIMENT TRANSPORT ON THE CONTINENTAL SHELF OFF OF WASHINGTON AND OREGON IN LIGHT OF RECENT CURRENT MEASUREMENTS, Washington Univ., Seattle. Dept. of Oceanog-

J. D. Smith, and T. S. Hopkins.

In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 143-180, 1972. 16 fig, 2 tab, 34 ref. AEC Contract AT (45-1)-2225-T25.

Descriptors: *Sediment transport, *Continental shelf, *Washington, *Currents (Water), Suspended load, Bed load, Storms, Current meters, Data collections, Sampling, Bottom sediments, Particle size, Oceanography.

Current measurements were made on the central and outer parts of continental shelves off Washington and Oregon. Emphasis was placed upon obtaining a time series of at least a two-year duration at a single location. Significant sediment

Group 2J—Erosion and Sedimentation

transport occurs only during storms, and the nearbottom currents have a substantial offshore com-ponent. Suspended load transport of sediment is ponent, suspensed took transport of seatment is extremely important, whereas bedload transport of sediment is not. Although no completely satisfactory theory for suspended-sediment transport is available, estimates indicate that a typical winter storm with current speeds up to 60 cm per sec transports on the order of 6 cu m per hr per m of shelf length; a storm with speeds of up to 70 cm per sec transports about 15 cu m per hr per m off of the continental shelf and into deeper water. Such calculations suggest that a severe storm oc curring every few years might have more geologi-cal significance than a number of less severe storms. (See also W73-10746) (Knapp-USGS)

IMPLICATIONS OF SEDIMENT DISPERSAL FROM LONG-TERM, BOTTOM-CURRENT MEASUREMENTS ON THE CONTINENTAL SHELF OF WASHINGTON,
Washington Univ.. Seattle. Dept. of Oceanog-

raphy.
R. W. Sternberg, and D. A. McManus. R. W. Sternberg, and D. A. McManus. In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 181-194, 1972. 7 fig, 3 tab, 10 ref. AEC Contracts AT (45-1)-1725 and AT (45-

Descriptors: *Sediment transport, *Continental shelf, *Washington, *Currents (Water), Suspended load, Bed load, Storms, Current meters, Data collections, Sampling, Bottom sediments, Particle size, Oceanography.

Current speed and direction data collected near the seabed of the Washington continental shelf were analyzed for magnitude and directional response. Histograms show the directional variability of the various speed classes. Data within speed classes were averaged over monthly and an-nual periods to determine the net direction of ent of bottom water. On the continental shelf of Washington, the bottom currents respond strongly to the surface wind stress. Currents of all speeds show a high degree of directional variabili-ty; however, all bottom currents greater than 10 cm per sec exhibit an overall trend to the northwest. Sediment movement frequently occurs on the central continental shelf during the winter months. Lateral sediment dispersal (across the shelf) should occur as a result of the high variability of current direction with a net northward dis-placement of sediment. The maximum annual displacement that could be experienced by a sedi-mentary particle under the observed conditions is estimated to be approximately 220 km to the northwest. (See also W73-10746) (Knapp-USGS)

SHELF SEDIMENT TRANSPORT: A PROBA-

National Oceanic and Atmospheric Administra-tion, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. D. J. P. Swift, J. C. Ludwick, and W. R. Bochmer. In. Shaff Sadiment Transport: Process and Pat-

Loser, Switt, J. C. Ludwick, and W. R. Boehmer. In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 195-223, 1972. 8 fig, 5 tab, 33 ref.

Descriptors: *Sediment transport, *Continental shelf, *Markov processes, *Probability, *Statistical models, Sediment sorting, Sedimentation, Particle size, Distribution patterns.

For many purposes the most useful conceptual framework for the study of detrital sediments is transport system is study or detritial sectiments is that of the sediment transport system. A system is comprised of a sediment source and a dispersal zone which is at once a conduit and sink. Sediment transport systems impress granulometric and other petrographic gradients on their deposits by means of progressive sorting and similar mechanisms. Markov process modeling may be used for testing assumptions concerning sediment-transport systems. Transition probabilities are employed as operational substitutes for incompletely understood physical mechanisms. In particular, the granulometric evolution of a detrital sediment stream through a dispersal zone may be examined stage by stage. A simple, one-dimensional model consists of a Markov chain of nine transient states with nonzero transition probabilities between adjacent states only. Calculation of the limiting state probability distribution permits the further calculation of simulated sediment size frequency distributions across a hypothetical shelf. Progressive size sorting will occur in the model if the transport is over a depositional surface. If the input size distribution is not approximately normal, the distribution will evolve towards the normal configuration during the sorting process. In several variants of during the sorting process. In several variants of the model, standard deviation tends to decrease and kurtosis to increase. Skewness may increase, especially if the transport competence declines across the system. (See also W73-10746) (Knapp-USGS) W73-10755 W73-10755

TRANSPORT AND ESCAPE OF FINE-GRAINED SEDIMENT FROM SHELF AREAS, University of East Anglia, Norwich (England). School of Environmental Sciences.

In. McCave.

In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 225-248, 1972. 6 fig, 1 tab, 97 ref.

Descriptors: *Sediment transport, *Continental shelf, *Mud, Currents (Water), Density currents, Suspended load, Diffusion, Dispersion, Erosion, Ocean currents, Littoral drift.

Waves and tidal currents contribute to a process of diffusive transport of sediment across the con-tinental shelf. Critical erosion friction velocities tinental shelf. Critical erosion friction velocities for cohesive sediment are related to yield strength. Deposition is controlled by the nearbed concentration, settling velocity, and a limiting shear stress above which no sediment is deposited. Critical erosion shear stresses greater than limiting stress are required after only a few hours compaction of a freshly deposited bed. Thus deposits formed nearshore from high-concentration flows during calm weather may develop sufficient cohesive calm weather may develop sufficient cohesive strength to withstand storm conditions. Mid-shelf mud belts arise from diffusive transport across the shelf to deposition sites where wave and tidal ac-tivity are relatively lower than on the inner or outer shelf. Outer-shelf and blanket mud deposits outer snell. Outer-snell and tolanket mud deposits are caused by higher than average concentrations occurring under advective mud streams. Most suspended sediment escaping from shelves must be deposited on the slope and rise. Of this the greater part must be in cones and fans off the major input points. As the concentrations are very low, settling does not give the required rates of deposition, thus high-level escape of sediment is precluded, and escape from shelves must be mainly along the bottom. Possible transport anisms are cascading of cold water off the shelf in winter, water movement down submarine canyons, bottom Ekman layer transport downslope under major ocean boundary currents, and low-concentration turbidity currents. (See also W73-10746) (Knapp-USGS) W73-10756

SOURCES AND SINKS OF SUSPENDED MATTER ON CONTINENTAL SHELVES, Geological Survey, Woods Hole, Mass. R. H. Meade.

In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 249-262, 1972. 51 ref.

Descriptors: *Continental shelf, *Suspended load, *Provenance, *Sedimentation, Aquatic life, Bottom sediment, Dispersion, Sediment transport. Identifiers: *Sediment sources.

While river sediments are the principal sources of suspended matter on many continental shelves, their importance on the Atlantic Continental shelf of the United States is less than that of biogenic detritus produced by shelf organisms and of material resuspended from the shelf bottom. The major sites of accumulation of suspended matter from the Atlantic shelf are in the large estuaries and coastal marshlands rather than on the shelf itself or in the deep sea. Sources other than river sediments and sinks other than the sea floor should be given ample consideration in assessing the dispersal of suspended sediments on other continental margins of the world. (See also W73-10746) (Knapp-USGS)

SUSPENDED SEDIMENTS IN CONTINENTAL SHELF WATERS OFF CAPE BATTERAS.

SHELF WATERS OFF CAPE HATTERAS, NORTH CAROLINA, Illinois Univ., Chicago. Dept. of Geology. B. A. Buss, and K. S. Rodolfo. In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 263-279, 1972. 8 fig, 22 ref. NSF Grants GA-1072 and GA-12783.

Descriptors: *Suspended load, *Continental shelf, *Salinity, *Currents (Water), *Ocean currents, Waves (Water), Mixing, Bottom sediments, Water temperature, Remote sensing, Littoral drift. Identifiers: *Cape Hatteras.

Suspended sediment and salinity samples were taken at 46 stations over the Cape Hatteras shelf area August 26-28, 1970 to provide field data on the Cape Hatteras plume seen in Apollo 9 photographs. Relatively high levels of suspensate (more than 2 mg per liter) and waters of low salinity from Pamlico Sound issue onto the shelf through Okracoke and Hatteras Inlets. A portion of this outflow is moved southward by coastal currents. In the sheal waters off the cape mixing by wayses outriow is moved southward by coastal currents. In the shoal waters off the cape, mixing by waves and currents causes suspensions of between 0.5 and 1.0 mg per liter. Seaward, suspensions are gradually diluted to less than 0.10 mg per liter on the outer shelf and slope. (See also W73-10746) (K-napp. IJSGS) napp-USGS) W73-10758

MINERALOGY OF SUSPENDED SEDIMENT OFF THE SOUTHEASTERN UNITED STATES, Smithsonian Institution, Washington, D.C. Div. of

Sedimentology. J. W. Pierce, D. D. Nelson, and D. J. Colquhor J. W. Piette, D. Nesson, and D. J. Constantin.
In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 281-305, 1972. 8 fig, 5 tab, 39 ref. NSF Grants GB17545 and GA27725.

Descriptors: *Suspended load, *Continental shelf, *Mineralogy, *Provenance, Sampling, Currents (Water), Rivers, Distribution patterns, Ocean currents, Atlantic Ocean, Southeast U.S.

On the continental shelf from Chesapeake Bay to Savannah, Georgia, four water masses were found with distinct mineral suites suspended in the water. The mineralogy associated with each water-mass reflects the contribution of continental sedimass reflects the contribution of continental sedi-ment from the area where the watermasses originate. Minerals suspended in Carolinian coastal water apparently are the result of river ru-noff in the Carolinas and Georgia. The suite in the Virginian coastal water has northern affinities and probably originates north of Chesapeake Bay, Gulf stream and Carolinian slope water also have diagnostic suites. Mineralogy can be used to identify watermasses in the way that temperature and salinity have been used. (See also W73-10746) (Knapp-USGS)

Erosion and Sedimentation—Group 2J

SEDIMENT TRANSPORT ON THE SANTA

SEDIMENT TRANSPORT ON THE SANTA BARBARA-OXNARD SHELF, SANTA BARBARA-OXNARD SHELF, SANTA BARBARA-CHANNEL, CALIFORNIA, University of Southern California, Los Angeles. Dept. of Geological Sciences.
D. E. Drake, R. L. Kolpack, and P. J. Fischer.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroughburg Pennsylvania, a 307, 331 1972 18 fig. 2172 18 fig. 2172.

sburg, Pennsylvania, p 307-331, 1972. 18 fig, 2 tab, 20 ref.

Descriptors: *Sediment transport, *Continental shelf, *Floods, *California, Turbidity currents, Thermal stratification, Density currents, Littoral drift, Ocean currents, Waves (Water), Currents

The floods of January and February 1969 in California caused a record discharge of sediment nto the waters over the Santa Barbara-Oxnard Shelf. Following the floods, suspended sediment concentrations were highest over the inner shelf and exhibited an approximately exponential decrease across the shelf at all water depths. Conoccrease across me snett at an water depths. Con-centrations were generally highest near the bottom and ranged from approximately 50 mg per liter over the inner shelf during the floods to less than 1.0 mg per liter at the shelf break late in 1969 and early in 1970. Redistribution of the flood sediment involved rapid erosion over the inner shelf and transfer of this material to the middle and outer transfer of this material to the middle and outer shelf occurred within protected topographic depressions and in response to the seaward decline in current energies. Seaward transport of material occurred within a northwestward and westward flowing geostrophic current and within a current convergence trending across the shelf from Venturo. Transport of suspended particles across the shelf in the presence of thermal stratification within the water column resulted in detachment of turbid water from the near-bottom nepheloid layer. (See also W73-10746) (Knapp-USGS) W73-10760

COMMENTS ON THE DISPERSAL OF SUSPENDED SEDIMENT ACROSS THE CON-TINENTAL SHELVES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake

Bay Inst. J. R. Schubel, and A. Okubo.

In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 333-346, 1972. 7 fig, 14 ref. NSF Grants GA 28276 and GA 16603.

Descriptors: *Sediment transport, *Continental shelf, *Suspended load, *Dispersion, *Distribu-tion patterns, Sedimentation, Deposition (Sedi-ments), Surf, Silts, Estuaries, Rivers, Mathematidels, Littoral drift, Ocean currents, Cur-

Most fine-grained inorganic deep-sea sediment is derived from the continents and crossed the continental shelves to reach the ocean basins. Most of it crossed the shelves in suspension, but the routes and rates of transport are obscure. Most of the sediment now being discharged by rivers is trapped in estuaries, but nearly all that escapes crosses the shelf. A simple steady-state, two-dimensional mathematical model applied off the amensional mathematical model applied off the mouth of Chesapeake Bay supports the idea of bypassing of the shelf by fine-grained terrigenous sediment, and suggests that much of the fine-grained sediment that escapes the estuaries may be accumulating on the continental slope and rise. The cross-shelf flux of sediment associated with the mean (residual) flow can account for most of the sediment that reaches the ocean basins. (See also W73-10746) (Knapp-USGS) W73-10761

SOME SPECIFIC PROBLEMS IN DERSTANDING BOTTOM SEDIMENT DIS- TRIBUTION AND DISPERSAL ON THE CON-TINENTAL SHELF,
Washington Univ., Seattle. Dept. of Oceanog-

washington tours, Seattle. Dept. of Geeanog-raphy.

J. S. Creager, and R. W. Sternberg.

In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 347-362, 1972. 3 fig, 1 tab, 34 rgf.

Descriptors: *Sediment transport, *Continental shelf, *Suspended load, *Dispersion, *Distribution patterns, Sedimentation, Deposition (Sediments), Surf, Silts, Estuaries, Rivers, Mathematical models, Littoral drift, Ocean currents, Currents (Water), *Bottom sediments.

Research into the problems of continental-shelf-sediment classification, distribution, and dispersal mechanisms should not be a simplistic study of sediment distribution alone. The dispersal mechanisms which have sometimes been intuitivemechanisms which have sometimes been intuitively deduced must be observed and measured. Study of the processes rather than the results must be an immediate goal. An example is presented to point out how intuition has led to a general misunderstanding of the sediment types present on Arctic continental shelves. This has led to a second-order misinterpretation of dispersal mechanisms deduced from the generality that Arctic continental shelves are covered by glacial sediment. A second example is given of the problems encountered in attempting to apply a wave-surge dominated, shelf sediment dispersal model to the Washington continental shelf. (See also W73-10762

EMPLICATIONS OF SEDIMENT DISPERSAL FROM BOTTOM CURRENT MEASUREMENTS; SOME SPECIFIC PROBLEMS IN UNDERSTANDING BOTTOM SEDIMENT DISTRIBUTION AND DISPERSAL ON THE CONTINENTAL SHELF-A DISCUSSION OF TWO BABERS.

PAPERS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and
Meteorological Labs.
D. J. P. Swift.
Lu, Shaff Sediment Transport, Process and Bat-

In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 363-371, 1972. 1 fig, 23 ref.

Descriptors: *Sediment transport, *Continental shelf, *Suspended load, *Dispersion, *Distribution patterns, Sedimentalion, Deposition (Sediments), Surf, Silts, Estuaries, Rivers, Mathematical models, Littoral drift, Ocean currents, Current (Mathematical)

The wind-drift component of shelf storm currents is a major, if not dominant, cause of unidirectional currents over large portions of most nontidal shelves. The current velocity field over the shelf is shelves. The current velocity field over the shelf is complex. In storm-generated bottom currents a unidirectional component of compound origin is dominant, and the surge-dominated flow is characterized but not confined to the fair-weather hydraulic regime. Shelf currents are frequently of compound origin. Such an approach to study of sediments may encourage examination of the role of waves as a contributing factor in shelf sediment transport. A simple random walk model for sediment transport across the shelf does not accurately describe the advective component of sediment transport. It does, however, accomponent of sediment transport It does however, accomponent of transport. It does, however, accommodate the diffusive component. The more flexible Markov-process model is valid for both components. (See also W73-10746) (Knapp-USGS)

SEDIMENT TRANSPORT AROUND THE BRITISH ISLES,
National Inst. of Oceanography, Wormley (En-A. H. Stride

In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 373-375, 1972. 10 ref.

Descriptors: *Sediment transport, *Continental shelf, *Sedimentation, *Distribution patterns, *Sedimentary structures, Tides, Waves (Water), Currents (Water), Water circulation, Ocean cur-Identifiers: *British Isles.

The sea floor around the British Isles is a good re-gion for studying sedimentation processes. The strong currents occurring in some regions produce a suite of characteristic bed forms. There are extensive areas of floor at most depths down to ut 200 m, with enclosed seas, narrow straits, and long open reaches of ocean-facing continental shelf. Some floors were heavily glaciated while others lay beyond the ice sheets. The main currents are tidal, with strength near the sea surface reaching between one half and 4 knots over large areas; other currents are intermittent, more varia-ble in direction and generally weak. The known bed forms include longitudinal furrows and gravel waves, sand ribbons, and sand waves. The direction of net transport of sand and gravel seems to be determined by the peak tidal current asymmetry, while storm waves can increase the transport more than twentyfold in winter. There are extensive sheetlike deposits of gravel, sand, and silt where grade is in equilibrium with current strength. Sand deposits being laid on a gravel floor can be represented by isolated patches when sand is in short supply. Elsewhere, there are isolated deposits of sand tied to estuaries, bays, headlands, straits, and to the edge of the continental shelf. (See also W73-10746) (Knapp-USGS)

MIGRATION OF TIDAL SAND WAVES IN CHESAPEAKE BAY ENTRANCE, Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.

J. C. Ludwick

In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 377-410, 1972. 10 fig, 2 tab, 62 ref.

Descriptors: *Sand waves, *Chesapeake Bay, *Continental shelf, *Shoals, *Sediment transport, Sedimentary structures, Sedimentation, Tides, Water circulation, Estuaries, Currents (Water),

Subtidal sand waves occur atop shoals and on Subtidal sand waves occur atop shoals and on shoal margins in the northern part of the tidal entrance to Chesapeake Bay, Virginia. Wavelength ranges from 60 to 245 m; height ranges from 1.5 to 3.4 m. All major slopes are 2 to 3 deg, far less than the angle of repose. In flood-dominated tidal channels, sand waves are asymmetrical and face landwards; in ebb-dominated tidal channels and atop most banks and channels and atop most banks and atop most banks and atop most banks and atop most banks. most banks, sand waves face seawards. Where near-bottom flood and ebb tidal currents are equal in time-velocity impulse, sand waves of symmetri-cal-trochoidal profile are developed. The seawardfacing asymmetrical sand waves are migrating facing asymmetrical sand waves are migrating seaward at 35 to 150 m per yr. Sand wave height changes seasonally; small heights occur from October to late April when surface water waves are frequently higher than 1.5 m; large sand wave heights occur from May to September, particularly during the latter month when surface water waves are usually lower than 1.5 m in height. Prominant shoals in the entrance area characteristically have ebb-dominated near-bottom tidal currents on one side and flood-dominated near-bottom tidal cur-rents on the other side. This pattern is suggestive of a sand circulation conjoint with the shoal. (See also W73-10746) (Knapp-USGS).

Group 2J—Erosion and Sedimentation

WATER CIRCULATION AND SEDIMENTA TION AT ESTUARY ENTRANCES ON THE GEORGIA COAST, Skidaway Inst. of Oceanography, Savannah, Ga.

Skidaway Inst. of Oceanography, Savannah, Ga. G. F. Oertel, II, and J. D. Howard.

G. F. Oertel, II, and J. D. Howard.
In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 411-427, 1972. 12 fig. 31 ref. USCE Contract DACW 72-68-C-0030, NSF Grant GA-30565.

Descriptors: *Sedimentation, *Coastal plains, *Shoals, *Georgia, *Estuaries, Water circulation, Currents (Water), Tides, Waves, Littoral drift, Aggradation, Sediment transport, Distribution pat-

Estuary entrance-shoals extend seaward of all major entrances of the Georgia coast. Orientations and morphologies of these shoals are in response to (a) transient coastal currents controlled by seasonal winds, (b) relationships of ebb jets to coastal currents, and (c) hydraulic pressure gradients at entrances. Northeasterly winds create high-energy swells which result in southward high-energy swells which result in southward diversion of longshore drift and aggradation of shoals on the north sides of inlets. These shoals are detached from the shoreline and are generally breached in several places by small tidal channels. Attached shoals on the south sides of inlets are starved during these periods. Southerly onshore winds result in currents which cause seaward prograding of shoals on the south sides of inlets. At the same time, sediment cells and gyres trap sediment on shoals on the north sides of inlets and accretion is multidirectional. (See also W73-10746) (Knapp-USGS) W73-10766

ONSHORE TRANSPORTATION OF CON-TINENTAL SHELF SEDIMENT: ATLANTIC SOUTHEASTERN UNITED STATES, Duke Univ., Durham, N.C. Dept. of Geology; and Duke Univ., Beaufort, N.C. Marine Lab. O.H. Pilkey, and M. E. Field. In: Shelf Sediment Transport: Process and Pat-

tern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 429-446, 1972. 6 fig. 1 tab, 35 ref.

Descriptors: *Sediment transport, *Provenance, *Continental shelf, *Beaches, Coasts, Mineralogy, Sands, Surf, Water level fluctuations, Distribution patterns.

Beach and estuarine sands on the southeastern United States Atlantic coast are derived in part from the adjacent continental shelf. Anomalies in abundances of phosphorite grains, in total gold content, in ooids, and in various heavy minerals (in particular, epidote, staurolite, and garnet) on the shelf show a close correspondence to anoma-lies in adjacent shoreline and near-shore environments. Carbonate content and textures of beach and shelf deposits show a correlation between the and shelf deposits show a correlation between the two environments on a regional scale. Oolitic grains in central Florida beach sands and phosphorite grains on North Carolina beaches originate exclusively from continental shelf sources lying appreciable distances (up to 20 km) offshore, thus demonstrating onshore transportation in these cases. The presence of easily abraded, shelf-derived oolite grains in quartz heach angle is evidence of onshore transportation. beach sands is evidence of onshore transportation occurring at present. Some of the inferred move-ment of sediment may have occurred actually by the simple process of landward migration of the surf wedge or shoreface during the last rise in sea level rather than by present-day processes. Possi ble mechanisms of present-day movement include asymmetry of shoaling waves and tidal and storm-induced currents. (See also W73-10746) (Knapp-W73-10767

LINEAR SHOALS ON THE ATLANTIC INNER CONTINENTAL SHELF, FLORIDA TO LONG

SIAND,
Army Coastal Engineering Research Center,
Washington, D.C.

Army Coastal Engineering Research Center, Washington, D.C.
D. B. Duane, M. E. Field, E. P. Meisburger, D. J.
P. Swift, and S. J. Williams.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 447-498, 1972. 22 fig, 1 tab, 69 ref.

Descriptors: *Sedimentation, *Coastal plains, *Shoals, Sand bars, Aggradation, Sediment transport, Sands, Coasts, Sand spits, Estuaries, Distribution patterns.

port, sanns, coasts, Sand spits, Estuaries, Distribution patterns.

The inner Atlantic continental shelf from Long Island to Florida is characterized by fields of linear, northeast trending shoals. The shoals have up to 30 ft of relief, have side slopes of a few degrees and extend for tens of miles. Clusters of linear shoals merge with the shoreface in water as shallow as 10 ft. These inner-shelf sand bodies or shoals can be grouped as arcuate (inlet and cape-associated) and linear. Linear shoals may radiate from estuary mouths, as a second order structure on arcuate, inlet-associated shoals, or may occur on the open coast. Linear shoals on the open coast may be shoreface-connected or isolated. All linear shoals of the open coast form a small angle with the coast line; most open northward regardless of presumed direction of net littoral drift. The cape-associated shoals are plano-convex features resting upon a featureless, nearly horizontal stratum. Formation of shoals post-dated the last transgression; hence they are all younger than at least 11,000 BP. Changes in mineralogy of the shoals parallel changes in the mineralogy of adjacent beaches. Shoreface-connected shoals appear to be forming in response to the interaction of south-trending, shore-parallel, wind setup currents with wavegenerated bottom currents during winter storms. The helical flow that they induce in coast-parallel storm currents causes aggradation of their crests and fair-weather wave surge degrades them. Equilibrium shoal crest depth is about 30 ft on the inner shelf. A second mode of crest depth at 50 ft may reflect a recent stillstand at that level. (See also W73-10746) (Knapp-USGS)

HOLOCENE EVOLUTION OF THE SHELF SURFACE, CENTRAL AND SOUTHERN AT-LANTIC SHELF OF NORTH AMERICA, National Oceanic and Atmospheric Administra-tion, Miami, Fla. Atlantic Oceanographic and

D. J. P. Swift, J. W. Kofoed, F. P. Saulsbury, and

In: Shelf Sediment Transport: Process and Pat-tern; Dowden, Hutchinson and Ross, Inc., Stroud-sburg, Pennsylvania, p 499-574, 1972. 41 fig, 3 tab,

Descriptors: *Sedimentation, *Erosion, *Geomorphology, *Continental shelf, *Sediment transport, Beaches, Sedimentary structures, Shoals, Sand bars, Sand waves, Sand spits, Recent epoch, Pleistocene epoch, Distribution

The floor of the central and southern Atlantic shelf shows relict geomorphic features. An initial pat-tern is an erosional one consisting of major trans-verse shelf valleys and plateaulike interfluves. The verse shelf valleys and plateaulike interfluves. The dominant modern pattern is that of constructional topography formed at the foot of the shoreface. This constructional pattern is undergoing further modification in response to the modern hydraulic regime. A rise in sea level over an unconsolidated coast results in shore-face erosion, equivalent to parallel slope retrest, and a concomitant aggradation of the adjacent sea floor. The resulting discontinuous debris mantle, the Holocene transgressive sand sheet, is only partly autochthonous with respect to the Holocene sedimentary cycle, since it incorporates Holocene fluvial deposits. The surface of this sand sheet has been molded into a variety of morphologic elements. Where the sheet has been generated directly from the retreating shoreface, a ridge-and-swale topography has been empressed upon it. Off cuspate forelands, the convergence of littoral drift with the reversing estuary tide has created inlet-associated shoals. Off estuary mouths the intersection of littoral drift with the reversing estuary tide has created inlet-associated shoals. Shelf-transverse sand bodies, formed by the progressive landward displacement of shoreline deposition centers, are shoal-retreat massifs. The ridge-and-swale topography is a stable end-configuration toward which a variety of depositional and erosional topographies tend to converse. Southward sediment transport in the Middle Atlantic bight intensifies toward shore and toward the south, as far as Florida. (See also W73-10746) (Knapp-USGS) W73-10769

SEDIMENT TEXTURAL PATTERNS ON SAN PEDRO SHELF, CALIFORNIA (1951-1971): RE-WORKING AND TRANSPORT BY WAVES AND

CURRENTS,
University of Southern California, Los Angeles.
Dept. of Geological Sciences.
D. S. Gorstine, and D. J. Grant.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 575-600, 1972. 15 fig, 2 tab, 40 ref.

Descriptors: "Sediment transport, "Particle size, "California, "Continential shelf, Sediment sorting, Littoral drift, Ocean currents, Currents (Water), Sedimentation, Tides, Waves (Water), Sedimentology, Distribution patterns.

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Trend surfaces of sediment-size parameters of the San Pedro Shelf, California, calculated as moment measures show patterns that can be related to long wave and local current regimes. The shelf, off Los Angeles, is located in a region of intermediate wave energy, but is screened by offshore islands from most of the open ocean waves from the Pacific except for limited westerly and southerly approaches. Currents are tidal, wind-driven, and wave-generated long-shore drift from both south and west. An outer central zone of 20-40 m depth is probably affected by westerly and southerly long-period storm-wave convergence and prevailing wind-driven currents; a central area of outcropping Miocene rocks and relict sediments is being modified texturally by fine sediment drifted ropping Miocene rocks and relict sediments is being modified texturally by fine sediment drifted from the west; a southeastern coastal zone is dominated by north-flowing long-shore drift alongshore and by tidal exchange moving east from Los Angeles-Long Beach Harbor. Comparison of recent (1969-1970) data with earlier work (1951) shows some differences that suggest that the surficial sediments of the entire shelf surface are subject to change in a period of a couple of decades. Changes include both intrusion of fine sediments into a stable coarse sediment and active different into a stable coarse sediment and active with the surfacial may extend to depths of as much as 100 m. (See also W73-10746) (Knapp-USGS) W73-10770

OBSERVATIONS AND SIGNIFICANCE OF DEEP-WATER OSCILLATORY RIPPLE MARKS ON THE OREGON CONTINENTAL SHELF.

Oregon State Univ., Corvallis. School of Oceanog-

raphy.
P. D. Komar, R. H. Neudeck, and L. D. Kulm.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p. 601-619, 1972. 8 fig. 3 tab, 23 ref. USGS Contracts 14-08-001-10766, -1194,

Erosion and Sedimentation—Group 2J

Descriptors: "Sediment transport, "Continental shelf, "Oregon, "Ripple marks, "Waves (Water), Currents (Water), Storms, Sedimentary struc-tures, Sand waves, Ocean currents, Littoral drift.

Symmetrical oscillatory ripple marks are found across the entire Oregon continental shelf out to water depths as great as 204 m. The ripples are principally of the trochoidal type, the creats trending north-south, parallel to the coast. Asymmetrical ripples are rare. Using Airy wave theory, bottom orbital velocities were calculated for average waves and storm waves. Velocities are sufficient to produce ripples out to depths of 100 m with occasional rippling to 200 m. Systematic variations in ripple length could be produced by a pattern of dispersed wave periods arriving from a distance-storm source. Besides producing ripples, the surface waves appear to be important in stirring and reworking the shelf sediments. Sediment transport on the shelf was examined with the Bagnold model in which the waves provide the power to place the on the sheat was examined with the Bagnoid model in which the waves provide the power to place the bottom sediments in motion and a superimposed unidirectional current produces a net sediment drift. It is concluded that the effects of surface drift. It is concluded that the effects of surface waves, as well as unidirectional currents, must be included in estimates of sediment transport on the continental shelf. (See also W73-10746) (Knapp-USGS) W73-10771

CURRENTS AND SEDIMENT TRANSPORT AT THE WILMINGTON CANYON SHELFBREAK, AS OBSERVED BY UNDERWATER TELEVI-SION,

Saurit, omining institution, Washington, D.C. Div. of Sedimentology.
D. J. Stanley, P. Fenner, and G. Kelling.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 621-644, 1972. 6 fig, 1 tab, 37 ref.

Descriptors: *Sediment transport, *Continental shelf, *Remote sensing, *Instrumentation, *Photography, Currents (Water), Tides, Waves (Water), Suspended load, Bed load, Identifiers: *Television (Underwater).

Identifiers: *Television (Underwater).

An underwater television survey was made of the outer shelf, shelfbreak, and upper slope in the vicinity of Wilmington Canyon, about 175 km southeast of Delaware Bay and the Middle Atlantic States. It provides direct evidence of active currents and sediment transport at 26 stations, in water depths ranging from about 65 to 430 m. The 22 hr of videotape recorded for this study covered an area of about 400 sq km. The system allows documentation of current activity and the movement of sand and silt from the outer shelf to deeper environments seaward of the shelfbreak. Although the survey was made during a very calm period with low sea states, bottom currents competent to move sediment on the sea floor were observed in the near-bottom water and probably were scoured from the sea floor by these bottom currents and subsequently transported by movement of water masses in the vicinity of the shelfbreak. The regional current net in Wilmington Canyon shows a varied directional pattern of flow, presumably influenced by tides. Recorded velocities of up to 20 cm per sea are of sufficient intensity to move fine sand and silt along the bottom and eventually off the shelf to the adjacent slope and canyon. (See also W73-10746) (Knapp-USGS)

NEARSHORE SEDIMENTARY PROCESSES AS

NEARSHORE SEDIMENTARY PROCESSES AS GEOLOGIC STUDIES, Skidaway Inst. of Oceanography, Savannah, Ga. J. D. Howard.
In: Shelf Sediment Transport: Process and Pattern; Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pennsylvania, p 645-648, 1972.

Descriptors: *Sedimentology, *Continental shelf, *Sediment transport, *Stratigraphy, *Distribution patterns, Currents (Water), Waves (Water).

Studies of nearshore sedimentary environments and their processes can be improved if those studying the modern and those investigating the ancient have a point of common interest. A definite possibility for this exists in the study of physical and biogenic sedimentary structures which represent the responses to processes. If an offshore-to-beach sequence the spectrum of energy changes in a predictable way even though the energy maxima vary. As the energy varies, so do the processes, and responses to processes, which determine the preservable facies characteristics. In such studies the Uniformitarian Principle is an obvious and necessary tool. Equally important is the opportunity to utilize the ancient as a key to understanding and predicting present-day processes. (See also W73-10746) (Knapp-USGS) W73-10773

DYNAMICS OF SILICON IN THE BLACK SEA AS OBSERVED ALONG THE CAPE KHER-SONES-BOSPORUS PROFILE (DINAMIKA KREMNIYA V CHERNOM MORE PO MATERI-ALAM NABLYUDENIY NA RAZREZEMYS KHERSONES-PROLIV BOSFOR), Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).

For primary bibliographic entry see Field 02K. W73-10780

ORGANIC MATTER IN THE EASTERN SIVASH

ORGANICHESKOYE VESHCHESTVO V
VOSTOCHNOM SIVASHE),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol

For primary bibliographic entry see Field 02K. W73-10783

TRACE METALS IN CORES FROM THE GREAT MARSH, LEWES, DELAWARE. Delaware Univ., Newark. Dept. of Geology. R. N. Strom, and R. B. Biggs. Available from NTIS Springfield, Va 22151 as COM-73-10206, Price \$3.00 printed copy; \$0.95 microfiche. College of Marine Studies Report DEL-SG-12-72, December 1972. 35 p. 12 fig, 7 ref, 2 append. NOAA Sea Grant 2-35223. TRACE METALS IN CORES FROM THE

Descriptors: *Trace elements, *Sediments, *Coastal marshes, *Delaware, *Metals, Cores, Chemical analysis, Geochemistry, Salt marshes, Sedimentology, Correlation analysis, Depth, Zinc, Copper, Chromium, Iron, Lead, Cadmium. Identifiers: *Great Marsh (Del)

Four 12-foot sediment cores and one 18-foot core were taken in the Great Marsh (Broadkill Marsh) Four 12-foot sediment cores and one 18-foot core were taken in the Great Marsh (Brondkill Marsh) near Lewes, Delaware, for the purpose of analyzing the areal and vertical changes in trace metal concentration in sediments deposited prior to the industrialization of the Delaware Bay watershed. The sediments are of marginal marine origin of brackish or saltwater conditions. The sediments of the Great Marsh were deposited during the Holocene marine transgression and deposition is apparently continuing unabated today. Lagoonal muds underlie the more recently formed saltmarsh materials. Beginning at 2 feet below land surface, samples were analyzed at 2-foot intervals for zinc, copper, chromium, iron, lead and cadmium. The levels of lead and cadmium were below the level of detectability (i.e. less than 1 ppm in the sediment sample). Zinc showed a slight increase in average concentration with increasing depth. Copper and cadmium showed no significant changes with depth. There appears to be no significant changes with depth. There appears to be no significant difference in the metal concentrations between the <63 micron and >63 micron fractions. (Woodard-USGS) W73-10971 FIELD EXPERIMENTS ON FREEZING AND THAWING AT 3.350 METERS IN THE ROCKY MOUNTAINS OF COLORADO, U.S.A., Universidad Nacional del Sur, Bahia Blanca (Arnary bibliographic entry see Field 02C.

PRELIMINARY OBSERVATIONS ON DOWNSLOPE MOVEMENT OF SOIL DURING THE FALL IN THE CHINOOK BELT OF AL-BERTA, S. A. Harris

S. A. Harris.

In: Research Methods in Pleistocene
Geomorphology; Proceedings of 2nd Symposium
of Geomorphology, Summer 1971, Guelph, Ontario, Canada: Guelph University Publication, p
275-285, 1972. 5 fig, 8 ref.

Descriptors: *Mass wasting, *Alpine, *Canada *Creep, Solifluction, Degradation (Slope), Snow melt, Soil moisture, On-site data collections. Identifiers: Kananaskis Valley (Alberta).

The main process operating on the slopes at Kananaskis, Alberta, during fall and winter is surface creep. This movement is the result of several processes producing similar effects under different conditions. The end product is a steady downslope movement of the upper sheet of soil and unconsolidated material. The movement is such that on a slope of 34 deg under a bearberry-rose association, the movement downslope amounts to over 130 mm between October and March. No runoff was observed. Accordingly, water erosion has been absent during the fall 1970 and winter 1970-71. Soil creep is the major element in movement of material. Solifluction and mudflows were not observed. Frost boils were observed on scree and on bearberry covered slopes of up to 20 deg. Snow creep occurred at the two sites where the snow was deepest. (Knapp-USGS) W73-10977

DATING CAVE CALCITE DEPOSITS BY THE URANIUM DISEQUILIBRIUM METHOD: SOME PRELIMINARY RESULTS FROM CROWSNEST PASS, ALBERTA, McMaster Univ., Hamilton (Ontario).

D. C. Ford, P. Thompson, and H. P. Schwarcz.
In: Research Methods in Pleistocene Geomorphology; Proceedings of 2nd Symposium on Geomorphology, Summer 1971, Guelph, Ontario, Canada: Guelph University Publication, p 247-255, 1972. 2 fig, 1 tab, 13 ref.

Descriptors: *Karst, *Radioactive dating, *Calcite, *Uranium radioisotopes, *Glaciation, Erosion, Scour, Pleistocene epoch, Topography, Geomorphology, *Canada.

Uranium trapped within a calcite deposit is a potential clock, recording the time elapsed since precipitation by measurable radioactive decay. Specimens of ancient or recent calcite were taken from eight caves in the Canadian Rockies and the modern uranium ion concentrations were measured in underground stream and percolation waters. The calcite specimens were deposited in phreatic cave sites which were air-filled when net deposition began. Dating and hydrogeological interpretation of the dates suggest that at least 2,600 (reet (or 63%) of the present relief existed 275,000 years ago; 90% of the relief existed 275,000 years ago; 90% of the relief existed at 200,000 years B.P., before the onset of the penultimate glacial. Since that time the valleys have been lowered by no more than 400 feet. The mean rate of lowering for the past 200,000 years is 2 feet per thousand years or somehat less. (Knapp-USGS)

BIOTURBATION RATES AND EFFECTS IN CARBONATE SAND, ST. JOHN, U.S. VIRGIN ISLAND, Geological Survey, Menlo Park, Calif. H. E. Clifton, and R. E. Hunter.

Group 2J-Erosion and Sed mentation

Journal of Geology, Vol 81, No 3, p 253-268, May 1973. 9 fig, 1 tab, 43 ref.

Descriptors: *Bottom sediments, *Carbonates, *Benthos, *Aquatic animals, Sedimentary structures, Benthic fauna, Marine animals, Sands. Identifiers: *Bioturbation, *Carbonate sands.

Bioturbational rates and effects were studied in carbonate sand at depths from about 10 to 20 m near a coral reef. Inactive sand ripples are totally destroyed in 2-4 weeks. Lamination in the upper 2 cm is largely obliterated in the same amount of time. Pebbles on the sea floor can be buried in a few days by faunal undermining. The rate and style of bioturbation are strongly controlled by grain size of the substrate. Surface modification and pebble burial are most rapid in relatively fine sand, whereas the rate of shallow internal disruption of the sediment may be more rapid in coarser sand. Bioturbation in this environment results largely from activity during daylight hours. A large amount of sediment can be moved vertically or laterally by such activity. (Knapp-USGS)

ACCELERATED MOTION OF A SPHEROID IN

VISCOUS FLUID, Wisconsin Univ., Milwaukee. Dept. of Energetics.

wisconsin Univ., Milwaukee, Dept. of Energetics. R. Y. S. Lai.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9809, p 939-957, June 1973. 8 fig., 12 ref, append.

Descriptors: *Settling velocity, *Particle s Mathematical studies, Sedimentation, Stokes law, Sedimentology.

The equation of motion of a spheroid accelerated along its axis of symmetry by an arbitrarily applied force in a viscous fluid is solved exactly. The soluforce in a viscous fluid is solved exactly. The solutions are presented in terms of tabulated functions. The unsteady drag predicted by the Stokes-flow solution was used in the analysis. Both prolate and oblate spheroids are considered. The results are reduced to those of the case of an accelerated sphere. A prolate spheroid with a ratio of major axis to minor axis equal to 1.96 has the greatest terminal settling velocity among spheroids of equal volume. The variations of velocity and displacement with time for some spheroids falling from rest are presented in graphs. (Knapp-USGS) W73-10989

AT-STREAM-VELOCITY PUMPING SEDI-MENT SAMPLING SYSTEM,

Geological Survey, Fort Collins, Colo. J. P. Bennett.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY6, Paper 9801, p 873-887, June 1973. 9 fig, 7 ref, append.

Descriptors: *Sampling, *Suspended load, *Sedimentology, Equipment, Instrumentation, Velocity, Open channel flow, Stream gages, Sediment transport, Streamflow, Water quality, Sediment transport, Streamflow, Water quality,

ment load.

A sampling system collects water-sediment samples at local stream velocity from any point in an open-channel flow. The system uses a flow-through Pitot tube as a combination velocity sensor and sampler nozzle. A sample of any desired volume can be collected without changing the position of the sampler nozzle. To compare the position of the sampler nozzle. To compare the performance of the system with that of other samplers, auspended-sediment samples were collected from a flat-bed flow using the system, a US DH-48 sampler modified for point sampling, and siphon sampler. On the basis of these samples, at the 99% confidence level, the relative percent difference between the concentrations of the samples from the system and the siphon sampler was between 5.45 and 4.45 and the relative percent difference between the concentrations of the samples from the system and from the US DH-48 was between 5.44 and 7.78. (Knapp-USGS)

W73-10992

THE EFFECT OF SILTING ON FLOW PROFILE UPSTREAM OF WEIRS—A CASE STUDY, For primary bibliographic entry see Field 08B. W73-10994

SEDIMENTATION STUDIES OF BHAKRA

RESERVOIR, A. N. Malhotra, and R. N. Hoon. Irrigation and Power (India), Vol 28, No 1, p 37-52, January 1971. 7 fig, 9 tab, 3 append.

Descriptors: *Sedimentation, *Reservoir silting, *Sedimentation rates, *Sediment control, Forest management, Land management, Land development, Construction, Check structures, Erosion control, Dams, Reservoir stages, Sediment trans-

port. Identifiers: *India (Bhakra Reservoir).

The Bhakra Dam in India was completed in October 1963 and has since changed the entire economy of the area it serves. The devastating floods have been controlled and benefits to irrigation and power have brought prosperity to the area. The direct and indirect benefits of the dam depend on the storage capacity of its reservoir. This has a designed live storage of 7434.23 million cubic meters and a dead storage of 2431.22 million cubic meters. Silt inflow into the reservoir affects the life of the dam. In an endeavor to correctly assess life of the dam. In an endeavor to correctly ass life of the dam. In an endeavor to correctly assess the life of the dam and to explore means to prolong it if possible, the catchment conditions have been studied and results of the capacity surveys, suspended silt measurements, analyzed. The present rate of sedimentation is somewhat higher than assumed. This is chiefly due to the catchment than assumed. This is chiefly due to the catchment area being poorly vegetated and disturbance of the soil by large scale development in the catchment area. The sedimentation has shown signs of reduction in the past few years. Remedies such as afforestation and check dams have been suggested to decrease the sedimentation rate and increase the life of the reservoir. (Woodard-USGS) W73-10998

2K. Chemical Processes

SPECTROGRAPHIC ANALYSIS OF METALS IN FRESHWATER SEDIMENTS, Eastern Michigan Univ., Ypsilanti. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-10407

RECONNAISSANCE OF CHEMICAL QUALITY OF SURFACE WATER AND FLUVIAL SEDI-MENT IN THE PRICE RIVER BASIN, UTAH, Geological Survey, Salt Lake City, Utah. J. C. Mundorff.

Utah Department of Natural Resources, Sait Lake City, Technical Publication No 39, 1972. 55 p, 13 fig, 3 plate, 5 tab, 22 ref.

Descriptors: *Water quality, *Chemical analysis, *Sediment transport, *Utah, River basins, Hydrologic data, Basic data collections, Climatic data, Streamflow, Geology, Vegetation, Land use, Reservoirs, Water utilization, Water supply, Irrigation, Coal mines, Environmental effects, Maps.

Identifiers: *Price River basin (Utah).

The Price River basin is mainly in Carbon and Emery Counties in east-central Utah, and the total drainage area is about 1,300 square miles. Normal annual precipitation (1931-60) is more than 30 inches in headwaters areas and is less than 8 inches in the downstream part of the basin. Surface rocks in the basin range in age from Jurassic to Quaternary, but the rocks having predominant influence on water quality are marine shales of

Creataceous age. The general chemical characteristics of the main stem of the Price River as determined by a reconnaissance during 1969-70 changed markedly between the headwaters and the mouth. The dissolved solids content ranged from less than 400 mg/liter in the headwaters to 2,740 mg/liter near the mouth. Suspended-sediment concentrations as high as 186,000 mg/liter were observed on a tributary, and as high as 111,000 mg/liter were observed on the Price River. A rough estimate of the suspended-sediment discharge of Price River at Woodside was at least 1,400,000 tons during the 1970 water year. (Woodard-USGS) (Woodard-W73-10423

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NONLINEAR STABILITY OF PLANE POISCUILLE FLOW OF VISCOELASTIC LIQUIDS, Delaware Univ., Newark. Dept. of Chemical En-For primary bibliographic entry see Field 02E. W73-10428

DETERMINATION OF NANOGRAM LEVELS OF SILVER IN SUSPENDED MATERIALS OF STREAMS RETAINED BY A MEMBRANE FILTER WITH THE "SAMPLING-BOAT"

TECKINGUE, Geological Survey, Denver, Colo. T. T. Chao, and J. W. Ball. Analytica Chimica Acta, Vol 54, p 166-168, 1971. 2

Descriptors: *Chemical analysis, *Metals, *Suspended solids, *Trace elements, Streams, Analytical techniques, Spectrophotometry, Sediments, Sampling, Testing procedures, Acids, Füters, Membranes, Spectroscopy.

Identifiers: *Silver determinations, Triisooctyl thiophosphate, Methyl isobutyl ketone, Nitric acid.

As one part of a study on the mechanisms of transport of silver in fluvial media, a number of water samples was collected from various streams in Colorado in the summer months of 1969 to be analyzed for silver. In general, 2.5 liters of water were taken from a stream and filtered through a 4-inch Gelman membrane filter at the sampling site. A plastic pressure filtration unit was used for the filtration of water under a nitrogen pressure of 40 psi. The filtered water was immediately acidified to pH I and saved for the determination of soluble silver in water. The analytical method consists of dry-ashing the membrane filter, digestion of the residue with nitric acid, quantitative extraction of silver into TOTP-MIBK (triisooctyl thiophosphate-methyl isobuytl ketone) stripping of silver back into 0.3 M hydrochloric acid, and measurement of the stripped silver with sampling-boat technique. Determinations are made with an atomic absorption spectrophotometer. (Woodard-USGS) e part of a study on the mechanisms of trans-As or USGS) W73-10429

CHEMICAL INTERACTIONS OF ALUMINUM WITH AQUEOUS SILICA AT 25 DEGREES C, Geological Survey, Washington, D.C. J. D. Hem, C. E. Roberson, C. J. Lind, and W. L.

Polzer.

For sale by GPO, Washington, D C 20402, Price \$0.70. Geological Survey Water-Supply Paper 1827-E, 1973. 57 p, 23 fig, 7 tab, 40 ref.

Descriptors: "Water chemistry, "Crystallization, "Clay minerals, Aluminum, Silicates, Hydrogen ion concentration, Mineralogy, Solubility, Kinetics, Weathering, Alkalis (Bases). Identifiers: "Halloysite.

Solutions containing from 0.00001 to 0.01 moles per liter of aluminum and dissolved silica in various ratios were aged at pH levels between 4 and 10

Chemical Processes—Group 2K

at 25 deg C. A collodial amorphous product having the composition of halloysite was produced in most solutions. It had a consistent and reversible most solutions. It had a consistent and reversible equilibrium solubility equivalent to a standard free energy of formation of -897 kcal per mole. Most solutions gave consistent solubilities after only a few months of aging. Electron micrographs and diffraction patterns of the synthesized material indicate some crystallimity in the aluminosilicate, but no X-ray diffraction patterns could be obtained even in the material aged 4 years. Aluminum contents of 51 samples of water analyzed for other purposes are in reasonable agreement with the assumption of equilibrium with amorphous clay mineral species similar to the material synthesized in this work. Solubility calculations are summarized graphically for solutions of ionic strength of 0.01 and 0.10. (Knapp-USGS)

A RAPID SENSITIVE METHOD FOR THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF POLLUTED WATERS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05A. W73-10434

GEOHYDROLOGIC RECONNAISSANCE AND STUDY PLAN FOR WATER RESOURCES INVESTIGATIONS IN THE BARODA-BROACH AREA, GUJARAT, INDIA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04A.

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE,
Central Soil Salinity Research Inst. Karnal (India).

For primary bibliographic entry see Field 02G. W73-10441

THE DETERMINATION OF VANDIUM IN BRINES BY ATOMIC ABSORPTION SPEC-TROSCOPY, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05A.

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 2, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 04B. W73-10445

EFFECT OF ION PAIRING ON THE PH OF SEAWATER, Rhode Island Univ., Kingston. Graduate School of

Limnology and Oceanography, Vol. 17, No. 6, p 959-960, November 1972, 12 ref.

Descriptors: *Hydrogen ion concentration, *Water pressure, *Calcium carbonate, Oxidation. Identifiers: *Ion pairing, *Biogenic oxidation, Dis-

The author disagrees with Wangersky's statement that the dominant influence on the pH of water not in contact with the atmosphere results from changes in ion pairing caused by pressure. Instead the cause should be attributed to biogenic oxida-tion and calcium carbonate dissolution. (Little-W73-10469

FREE ACIDS, Rome Univ. (Italy). Istituto di Chimica Analitica. For primary bibliographic entry see Field 05A. W73-10473 GAS-LIQUID-SOLID CHROMATOGRAPHY OF

DETERMINATION OF AMMONIACAL NITROGEN IN THE PRESENCE OF UREA WITH AN AMMONIA ELECTRODE, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Chemical Development. For primary bibliographic entry see Field 05A. W73-10474

TWO INSTRUMENTS FOR ACTIVATION ANALYSIS OF SOLUTIONS BY A DILUTION t voor Kernphysisch Onderzoek, Amsterdam (Netherlands).
For primary bibliographic entry see Field 07B.
W73-10509

THE EXTRACTION OF THE CHROMIUM (III)--EDTA COMPLEX BY SOLUTIONS OF ALIQUAT-336 IN VARIOUS ORGANIC SOL-Leeds Univ. (England). Dept. of Inorganic and Structural Chemistry.
For primary bibliographic entry see Field 05A.
W73-10523

STUDIES IN THE COMPLEX FORMATION OF METAL IONS WITH SUGARS. PART L THE COMPLEX FORMATION OF COBALT (II), COBALT (III), COPPER (II) AND NICKEL (II)
WITH MANNITOL,
Oslo Univ. (Norway). Dept. of Chemistry.
For primary bibliographic entry see Field 05B,
W73-10524

THE DIRECT DETERMINATION OF CHROMI-UM IN URINE BY SELECTIVE VOLATILIZA-TION WITH ATOM RESERVOIR ATOMIC AB-SORPTION, Environmental Protection Agency, Perrine, Fla. Perrine Primate Lab. For primary bibliographic entry see Field 05A. W73-10525

THE INDIRECT SPECTROPHOTOMETRIC DETERMINATION OF THE SULPHATE ION WITH 2-AMINOPERIMIDINE, Birmingham Univ. (England). Dept. of Chemistry. For primary bibliographic entry see Field 05A.

THE DETERMINATION OF MANGANESE IN URINE BY ATOMIC ABSORPTION SPECTROMETRY, Maryland Univ., College Park. Dept. of Chemis-For primary bibliographic entry see Field 05A. W73-10528

THE FLUORIMETRIC DETERMINATION OF PHOSPHATE WITH THIAMINE, Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre. For primary bibliographic entry see Field 05A. W73-10529

ATOMIC FLUORESCENCE TERISTICS OF COPPER IN PREMIXED FLAMES, CHARAC-VARIOUS Technical Univ. of Prague (Czechoslovakia). Lab. of Flame Spectrometry.
For primary bibliographic entry see Field 05A.
W73-10531

LARGER DIAMETER COLUMNS FOR MODERN, HIGH SPEED LIQUID CHROMATOGRAPHY, Delaware Univ., Newark.

J. J. DeStefano.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 72-31,983. Ph D Dissertation, 1972, 142 p.

Descriptors: *Efficiencies, *Separation techniques, *Laboratory equipment, Research equipment, Particle size. Identifiers: *Chromtographic columns, *Column preparation, *High speed liquid chromatography, Sample size, Chemical concentration, Liquid iquid chromatography, Liquid solid chromatography, Adsorbents, Porasil A.

raphy, Adsorbents, Porasil A.

Relatively large internal diameter columns are shown to exhibit superior efficiencies for both retained and unretained solutes when compared to narrow-bore, analytical liquid-liquid (LLC) and iquid-solid (LSC) chromatographic columns. This high level of column performance is ascribed to the 'infinite-diameter' column phenomenon proposed by Knox and Parcher. The controlled surface porosity support used in the LLC studies is shown to be capable of handling only modest amounts of solute without overloading. The totally porous silica adsorbent, Porasil A, used for LSC is found to be better suited for preparative applications because of its higher sample capacity. Sample sizes between 20 and 100 milligrams are demonstrated in two examples of preparative separations. The effects of sample volume and concentration, support particle size, and carrier velocity on column performance are also discussed. (Holoman-Battelle)

SPECTROMETRY, Virginia Univ., Cherlottesville, For primary bibliographic entry see Field 05A. W73-10541 STUDIES IN CHEMICAL IONIZATION MASS

METHOD FOR HIGH-SPEED LIQUID CHRO-MATOGRAPHIC ANALYSIS OF BENOMYL AND/OR METABOLITE RESIDUES IN COW MILK, URINE, FECES, AND TISSUES, Du Pont de Nemours (E. L) and Co., Wilmington, Del. Industrial and Biochemicals Dept. For primary bibliographic entry see Field 05A. W73-10547

OF CHROMATOGRAPHY GANONTROGEN PESTICIDES, USING A NITROGEN-SPECIFIC DETECTION SYSTEM, Food and Drug Administration, Buffalo, N.Y. For primary bibliographic entry see Field 05A. W73-10548

SODIUM AND MAGNESIUM SULFATE ION PAIRING: EVIDENCE FROM RAMAN SPEC-TROSCOPY, Rhode Island Univ., Kingston. Dept. of Chemis-For primary bibliographic entry see Field 01B. W73-10650

SIMULATION OF HYDROCHEMICAL PATTERNS IN REGIONAL GROUNDWATER TERRS IN REGIONAL GROUNTS AND TELOW, Alberta Univ., Edmonton. Dept. of Geology. F. W. Schwartz, and P. A. Domenico. Water Resources Research, Vol 9, No 3, p 707-720, June 1973. 7 fig, 8 tab, 20 ref.

Descriptors: *Water chemistry, *Hydrogeology, *Simulation analysis, *Groundwater basins, Mass transfer, Equilibrium, Kinetics, *Canada, Mathematical models, Leaching, Weathering,

Group 2K—Chemical Processes

The chemical state of a regional groundwater system in which several processes are acting is described by a simulation model that incorporates partial equilibrium, mass transfer, and reaction kinetics. Mineral dissolution, saturation constraints in dissolution, the degree of saturation, partial pressures of CO₂ reaction kinetics, and the residence time of the groundwater flow play different roles in determining the spatial distribution of ionic constituents. Simultaneous evaluation of several geochemical processes permits the study of interdependent phenomena such as shifts in equilibrium concentrations resulting from the addition of common ions by cation exchange or sulfate reduction processes. The utility of the model was demonstrated by applying it to the groundwater reservoir in the Upper Kettle Creek, Ontario, Canada, where a favorable comparison was achieved between the real and the theoretical hydrochemical patterns. (Knapp-USGS)

CHLORIDE BALANCE OF SOME FARMED AND FORESTED CATCHMENTS IN SOUTHWESTERN AUSTRALIA, Commonwealth Scientific and Industrial Research Organization, Wembley (Australia).
A. J. Peck, and D. H. Hurle.
Water Resources Research, Vol 9, No 3, p 648-657, June 1973. 1 fig, 5 tab, 25 ref.

Descriptors: *Saline water, *Leaching, *Salt balance, *Australia, Water quality, Water chemis-try, Water balance, Chlorides, Vegetation effects, Land use, Water pollution sources, Saline soils.

Loss of chloride in streamflow from forested catchments in southwestern Australia is only slightly greater than the total annual input from rain and dust. However, salt flow from catchments in which a significant area of the forest vegetation in which a significant area of the forest vegetation has been cleared for farming is much larger and exceeds salt input by up to 690 kg/ha per yr, or a factor of 21. The net loss of Cl results from decreased storage in catchment soil water. Removal of the forest vegetation increases groundwater discharge of catchments by amounts ranging from about 1 to 13 cm per yr. Characteristic times for equilibration of Cl input and loss on farmed catchments are estimated to range from on farmed catchments are estimated to range from 30 to 400 years. In equilibrium the salty streams draining farmed catchments would yield water with Cl concentrations acceptable for drinking. (Knapp-USGS) W73-10669

INORGANIC PHOSPHORUS IN SEAWATER, ROBGANIC PROSPROVES IN SEAWATER, Geological Survey, Mealo Park, Calif. R. A. Gulbrandsen, and C. E. Roberson. In: Environmental Phosphorus Handbook, E. J. Griffith, A. Beeton, J. M. Spencer and D. T. Mitchell editors: John Wiley and Sons, Inc., New York, N. Y., p 117-140, 1973. 5 fig, 9 tab, 44 ref.

Descriptors: *Phosphorus, *Sea water, *Oceans, *Water chemistry, *Chemical analysis, Water analysis, Phosphorus compounds, Inorganic compounds, Phosphates, Data collections, Atlantic Ocean, Pacific Ocean, Indian Ocean, Nutrients, Marine plants, Mixing, Ocean currents. Identifiers: Phosphoric acid.

The concentration of phosphorus in seawater is very small, an average of about 2.3 microgram very small, an average of about 2.3 microgram atoms of phosphorus per liter. This is inorganic phosphorus, as contrasted with organic forms, and is the dominant mode of phosphorus occurrence in seawater. The inorganic phosphorus occurs nearly entirely as orthophosphate ions; traces of polyphosphates have been reported and are considered as a possible indicator of pollution. Because phosphorus is one of the elements essential to all forms of life, it is one of the basic nutrient elements, the so-called nonconservative nutrient elements, the so-called nonconservative elements in seawater whose proportions with respect to such major constituents as sodium and

chlorine are not constant. Interocean mixing, estimated to occur within a time period of about 1000 years, accounts for the nearly constant proportions of the conservative elements in seawater. Most chemical determinations of phosphorus in seawater are of inorganic orthophosphate; however, total phosphorus determinations, which include the organic forms, have been made frequently in recent years. Vertical distributions of phosphorus are tabulated for some of the world's oceans and seas. (Woodard-USGS)

A NETWORK FOR CONTINUOUS MONITOR-ING OF WATER QUALITY IN THE SABINE RIVER BASIN, TEXAS AND LOUISIANA, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 05A.

TEST RESULTS OF SIX-MONTH TEST OF TWO WATER ELECTROLYSIS SYSTEMS, McDonnell Douglas Astronautics Com., Huntington Beach, Calif. Biotechnology and Power Dept. E. S. Mülls, and G. W. Wells. Available from NTIS, Springfield, Va 22151 N73-11093, Price \$30.00 printed copy. National Aeronautics and Space Administration Contract Report 128629, October 1972. 541 p, 182 fig, 13 tab, 6 ref. NAS9-12048.

Descriptors: *Electrolysis, *Satellites (Artificial), *Temperature control, Equipment, Testing procedures, Pressure, Oxygen, Monitoring, Computer programs, Evaluation, Water chemistry, Design criteria.

Identifiers: *Water electrolysis systems, *Space stations, NASA, Manned spacecraft.

Two water electrolysis systems used in the NASA space station simulation 90-day manned test of a regenerative life support system at the McDonnell Douglas Astronautics Company were refurbished as required and subjected to 26 weeks of testing. The two electrolysis units are both promising systems for oxygen and hydrogen generation and both needed extensive long-term testing to evaluate the performance of the respective cell designs and provide guidance for further development. These units have been considered seriously in the space station prototype environmental thermal control and life support program. The static vapor feed unit uses a vapor feed and intermittent circu-lation of electrolyte. The circulating electroyte lation of electrolyte. The circulating electroyte unit uses a liquid supply with continuous electrolyte circulation. Testing was conducted to evaluate performance in terms of current, pressure, variable oxygen demands, and orbital simulation. An automatic monitoring system was used to record, monitor, and print performance data at one-minute, ten-minute, or one-hour intervals. Performance data are presented for each day of system operation for each module used during the day. Failures are analyzed, remedial action taken to eliminate problems is discussed, and recommendations are made for redesign of future space applications. (Woodard-USGS)

GAS IN GROUND WATER. For primary bibliographic entry see Field 04B. W73-10713

GROUNDWATER RESOURCES OF COKE COUNTY, TEXAS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 04B.

COLLECTION OF PAPERS OF THE HYDROMETEOROLOGICAL OBSERVATORY OF THE BLACK SEA AND SEA OF AZOV

BASINS (SBORNIK RABOT BASSEYNOVOY GIDROMETEOROLOGICHESKOY OBSERV.
TORII CHERNOGO I AZOVSKOGO MOREY).
Basseinovaya i Gidrometeorologicheskaya Obse vatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).

A. I. Simonov, editor, Leningrad, 1970, No 8, 87 p.

Descriptors: "Water chemistry, "Sea water, "Inorganic compounds, Salts, Carbon dioxide, Nitrogen compounds, Phosphorus compounds, Organic matter, Productivity, Biomass, Flow, Currents (Water), Winds, Biology, Biochemistry, Dimensions, Seasonal, Annual, Variability, On-site investigations.

Identifiers: USSR, "Black Sea, "Sea of Azov, Silicon, Organic carbon, Mineralization.

icon, Organic carbon, Mineralization.

Results are presented of investigations of the hydrologic regime of the Black Sea and Sea of Azov. The dynamics of biogenous elements in the seas is examined, and studies are made of currents in the northwestern region of the Black Sea, carbon dioxide in waters of Yalta Bay, exchange of nutrient salts through the Kerch Strait, and organic-matter accumulation in brines and bottom sediments of centers. Sivesh leavons (See Williams) sediments of eastern Sivash lagoons. (See W73-10780 thru W73-10783) (Josefson-USGS) W73-10779

DYNAMICS OF SILICON IN THE BLACK SEA AS OBSERVED ALONG THE CAPE KHER-SONES-BOSPORUS PROFILE (DINAMIKA KERMINYA V CHERNOM MORE PO MATERIALAM NABLYUDENIY NA RAZREZEMYS KHERSONES-PROLIV BOSFOR), Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (ISSR)

(USSR). N. V. Demi

In: Basseynovaya gidrometeorologicheskaya ob-servatoriya Chernogo i Azovskogo morey, Sbor-nik rabot, No 8, p 22-29, Leningrad, 1970. 3 fig, 6 tab, 7 ref.

Descriptors: "Water chemistry, "Inorganic com-pounds, "Sea water, "Silica, Salinity, Depth, Profiles, Currents (Water), Phytoplankton, Seasonal, Variablity, Analytical techniques. Identifiers: USSR, "Black Sea, "Silicon.

Distribution of silicon in the Black Sea was investigated to depths of 150 m along the Cape Kherssones-Bosporus profile in 1962-67. Observations in January 1962 and February 1965 showed that the silicon content is higher in winter than during other seasons of the year. Average silicon concentrations at the sea surface reached 1,180 micrograms/liter in January and decreased to 850 micrograms/liter in February. The average value in March was 750 micrograms/liter. The silicon contact in August august 250,650 micrograms/liter. March was 750 micrograms/liter. The silicon con-tent in August averaged 550-650 micrograms/liter and increased in November to 900-950 micro-grams/liter. The concentration of silicon is rela-tively uniform to a depth of 20 m and increases at depths ranging from 50 m to 150 m. The profile dis-tribution of silicon is a dome-shaped isosurface produced by a closed system of circular currents and clearly reflected in the silicon to salinity ratio. (See also W73-10779) (Josefson-USGS) (See also W W73-10780

EXCHANGE OF NUTRIENTS SALTS THROUGH THE KERCH STRAIT (OBMEN
PITATEL'NYMI SOLYAMI CHEREZ
KERCHENSKIY PROLIV),

Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol

S. A. Nazarenko. In: Basseynovoya gidrometeorologicheskaya ob-servatoriya Chernogo i Azovskogo morey, Sbor-nik rabot, No 8, p 48-63, Leningrad, 1970. 1 fig, 7 Descriptors: "Water chemistry, "Sea water,
"Salts, "Phosphates, "Nitrogen compounds,
Nitrites, Nitrates, Ammonium salts, Seasonal, Annual, On-site investigations, Silica.
Identifiers: USSR, "Kerch Strait, Black Sea, Sea

Seasonal, annual, and average long-term exchange of nutrient salts between the Black Sea and Sea of Azov through the Kerch Strait was investigated in hydrochemical studies conducted in 1953-65. The amounts of nutrient salts transported annually from the Sea of Azov into the Black Sea included 322 metric tons of phosphates, 30,000 metric tons of silicon, and 1,055 metric tons of nitrites and circuse. The amounts of nutrients alts flowing an original states of the silicon of silicon and 1,055 metric tons of nitrites and silicon. nitrates. The amounts of nutrier to alts flowing annually into the Sea of Azov from the Black Sea included 137 metric tons of phosphates, 25,000 metric tons of stilicon, and 133 metric tons of intrites and nitrates. The annual loss of nutrient salts from the Sea of Azov was 6,000 metric tons. (See also W73-10779) (Josefson-USGS)

DYNAMICS OF MINERAL AND ORGANIC PHOSPHORUS IN THE SEA OF AZOV AFTER, REGULATION OF DON RIVER FLOW (DINAMIKA MINERAL'NOGO I ORGANICHESKOGO FOSFORA V AZOVSKOM MORE POSLE ZAREGULIROVANIVA STOKA REKI DONA),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR),
S. A. Nazarenko.
Bi: Basseypovaya gidrometeorologicheskaya observatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR),
S. A. Nazarenko.

In: Basseynovaya gidrometeorologicheskaya ob-servatoriya Chernogo i Azovskogo morey, Sbor-nik rabot, No 8, p 64-72, Leningrad, 1970. 4 tab, 8

Descriptors: "Water chemistry, "Phosphates, "Organophosphorus compounds, "Sea water, "Regulated flow, Regulation, Discharge (Water), Biology, Biochemistry, Annual, Seasonal, Variability. Identifiers: USSR, "Sea of Azov, "Don River, Gulf of Tagarrog, Mineralization.

The dynamics of mineralization.

The dynamics of mineral and organic phosphorus in the Sea of Azov was investigated in 1933-66 following regulation of flow of the Don River. In 1933-61, the phosphate content in the open sea was 10 micrograms/liter, while that in the Gulf of Taganrog was 20 micrograms/liter. In 1962-66, the hosphate content decreased to 7 micrograms/liter in the sea and to 13 micrograms/liter in the gulf. In 1938-61, the content of organic phosphorus in the open sea was 70 micrograms/liter, while that in the gulf was 87 micrograms/liter, in 1962-66, the content of organic phosphorus increased slightly, averaging 77 micrograms/liter in the sea and 106 micrograms/liter in the gulf. Annual variations in phosphorus content are associated with biochemical and biological processes in the sea and, to a lesser extent, with river discharge fluctuations. (See also W73-10779) (Josefson-USGS)

ORGANIC MATTER IN THE EASTERN SIVASH

ORGANICHESKOYE VESHCHESTVO V
VOSTOCHNOM SIVASHE),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol

(USSR). Yu. G. Slatinskiy.

.

In: Basseynovaya gidrometeorologicheskaya ob-servatoriya Chernogo i Azovskogo morey, Sbor-nik rabot, No 8, p 73-82, Leningrad, 1970. 2 tab, 17

Descriptors: *Organic matter, *Brines, *Bottom sediments, Sedimentation, Lagoons, Islands, Productivity, Biomass, Phytoplankton, Cladophora, Benthos, Depth, Areal, Volume. Identifiers: USSR, *Sivash, Organic carbon, Water exchange, Mineralization.

The amount of organic matter in brines and bottom sediments of eastern Sivash lagoons in the Crimea is extremely high. The average daily production of organic carbon from 24,000 metric tons of organic matter is 8 mg/liter. The annual accumulation of organic matter is about 13 million metric tons, of organic matter is about 13 million metric tons, of which 3.9 million metric tons becomes bottom sediment and 8.65 million metric tons remains in a suspended, colloidal, and dissolved state. A layer 2 mm-thick forms annually as a result of the sedi-mentation of organic substances. (See also W73-10779) (Josefson-USGS)

'IRON WATER' FROM WELLS: CAUSES AND

PREVENTION, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 04B.

A CONTRIBUTION TO THE KNOWLEDGE OF PHYSICAL AND CHEMICAL PROPERTIES OF THE GROUND WATERS IN THE SLOVENE

KARST, Yugoslav Academy of Sciences and Arts, Zagreb. For primary bibliographic entry see Field 02F.

SEPARATION AND PRECONCENTRATION, Leeds Univ. (England). School of Chemistry. For primary bibliographic entry see Field 05A.

NEW METHODS FOR THE DETERMINATION OF ELEMENTS IN TRACE AMOUNTS, Birmingham Univ. (England). Dept. of Chemist For primary bibliographic entry see Field 05A. W73-10862

TITRIMETRIC MICRODETERMINATION OF NICKEL AND COBALT, SEPARATELY AND IN PRESENCE OF EACH OTHER, Allahabad Univ. (India). Chemistry Labs. For primary bibliographic entry see Field 05A. W73-10863

CARBOHYDRATE COMPARATIVE GEOCHEMISTRY OF BAY, SALT MARSH, AND DEEP GULF SEDIMENTS, Delaware Univ., Newark. For primary bibliographic entry see Field 02L. W73-10972

DATING CAVE CALCITE DEPOSITS BY THE URANIUM DISEQUILIBRIUM METHOD:
SOME PRELIMINARY RESULTS FROM
CROWSNEST PASS, ALBERTA,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 02J.

RECONNAISSANCE OF THE MANISTEE RIVER, A COLD-WATER RIVER IN THE NORTHWESTERN PART OF MICHIGAN'S SOUTHERN PENINSULA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-10985

AN ANALYSIS OF STREAM TEMPERATURES IN LOUISIANA, Geological Survey, Baton Rouge, La. For primary bibliographic entry see Field 02G.

TRACE ELEMENT DETERMINATION WITH SEMICONDUCTOR DETECTOR X-RAY SPEC-TROMETERS, California Univ., Berkeley. Lawrence Berkeley

For primary bibliographic entry see Field 05A. W73-11031

SEPARATION AND CHARACTERIZATION OF DIMETHYLNITROBIPHENYL AND DIMETHYLBIPHENYLAMINE ISOMERS BY CHROMATOGRAPHIC AND SPECTROMET-CHROMATOGRAPHIC AND SPECTROMET-RIC METHODS, Baylor Coll. of Medicine, Houston, Tex. Inst. for Lipid Research. For primary bibliographic entry see Field 05A. W73-11032

TRACE ELEMENT ANALYSIS IN WATER BY PROTON ACTIVATION,
California Univ., Davis. Dept. of Applied Science.
For primary bibliographic entry see Field 05A.

ON-THE-FLY GAS CHROMATOGRAPHY-I-NFRARED SPECTROMETRY USING A CHOLESTERIC LIQUID CRYSTAL-EFFLUENT INTERFACE, Hunter Coll., New York. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-11034

THE USE OF GAS-LIQUID CHROMATOG-RAPHY FOR SELECTING EXTRACTIVE SOL-VENTS FOR LIQUID EXTRACTION PROCESSES, For primary bibliographic entry see Field 05A. W73-11036

COMPARISON OF FLAME AND FLAMELESS ATOMIC ABSORPTION FOR THE DETERMINATION OF CALCIUM, Cold Regions Research and Engineering Lab., Hanover, N.H.

J. H. Cragin, and M. M. Herron.
Atomic Absorption Newsletter, Vol 12, No 2, p 37-38, March-April 1973. 1 fig, 2 tab, 5 ref.

Descriptors: "Calcium, "Methodology, "Snow,
"Aqueous solutions, Chemical analysis, Pollutant
identification.
"Atomic absorption spectrophotometry, "Flameless atomic absorption
spectrophotometry, Precision, Detection limits,
Absorbance, Sensitivity, Graphite furnace.

Select glacial snow samples from Greenland were analyzed for calcium by both flame and flameless atomic absorption in order to compare the suitability of these techniques. A Perkin-Elmer Model 303 atomic absorption spectrophotometer and a single-element Ca Intensitron hollow cathode lamp were used. Flameless absorption values were obtained with an HGA-70 Graphite Furnace which was modified to interrupt the inert gas flow during atomization. Comparisons of the results from the two methods showed good agreement in reference to standard deviations. The addition of 0.1 percent La to samples gave no increase in absorbance into standard deviations. The addition of 0.1 percent La to samples gave no increase in absorbance indicating the absence of interferences for flame determinations. Consequently all flame measurements were performed without this additive. Precision was appreciably better with the graphite furnace: average standard deviations are 1.9 micrograms/1 for the flame and 0.3 micrograms/1 for the furnace. Flame and flameless atomic absorption determinations of calcium compare well in the 5 to 20 micrograms/1 range. Below 5 micrograms/1 calcium, the Graphite Furnace because of its improved precision is preferred to the flame. (Holoman-Battelle) W73-11037

Field 02-WATER CYCLE

Group 2K—Chemical Processes

THE APPLICATION OF FLAMELESS ATOMIC ABSORPTION IN HYDROGENOCHEMICAL

ANALYSIS, Institute of Geological Sciences, London (England). Dept. of Hydrogeology. W. M. Edmunds, D. R. Giddings, and M. Morgan-

Atomic Absorption Newsletter, Vol 12, No 2, p 45-49, March-April 1973. 6 fig, 3 tab, 8 ref.

Descriptors: Methodology, Chemical analysis, *Water analysis, *Brines, *Heavy metals, *Trace elements, *Groundwater, Saline water, Mananese, Iron, Nickel, Copper, Cobalt, Chromium, Molybdenum, Lead, Cadmium, Solvent extractions, Pollusant identification, Water pollution. Identifiers: *Heated graphite atomizer, *Flameless atomic absorption spectrophotometry, Sensitivity, Accuracy, Detection limits, Standard addition technique, Precision, Chemical interference.

A satisfactory procedure for the determination of trace metals in natural waters, based on the use of the heated graphite atomizer (HGA) has been developed. Mr. Fe, Ni, Cu, Co, Cr, Mo, Pb and Cd were investigated in water samples varying from dilute groundwaters to brines. Sample sizes were 10, 20, 50 or 100 microliters and the sample was injected into the furnace in triplicate by applying a constant pressure. Measurements were made using the standard calibration curve and the standard addition procedures. The overall precision varied between plus or minus 5 percent to plus or minus 10 percent at the 10 micrograms/1 level; precision for Cu, Co, Mn, Mo and possibly Ni was better than for the other elements. The sensitivity achieved was in general comparable with that quoted for the HGA by other workers, except for cadmium which is approximately ten times less sensitive. The detection limits shown for Co, Cr, Cu, Mn, Mo and Pb are generally of the same order as those quoted by the manufacturers, whereas the limit for Ni is stightly better. Relative-ly similar detection limits are obrained by solvent extractions. The results of solvent extraction and direct flame analyses of Cyronus groundwater samextractions. The results are obtained by solvent extractions. The results of solvent extraction and direct flame analyses of Cyprus groundwater samples showed good agreement in terms of accuracy of the method. (Holoman-Battelle)

SELECTIVE DETERMINATION OF HETERO-ORGANICS BY A DUAL-CHANNEL DETECTOR BASED ON FLAME CONDUCTIVITY AND

EMISSION, Missouri Univ., Columbia. Dept. of Agricultural For primary bibliographic entry see Field 05A. W73-11040

2L. Estuaries

EFFECTS OF MOSQUITO CONTROL DITCHING ON ESTUARINE ECOSYSTEMS, North Carolina Univ., Chapel Hill. Dept. of En-vironmental Sciences and Engineering. For primary bibliographic entry see Field 05G, W73-10410

THE INFLUENCE OF BENTHIC BARK DEPOSITS ON AQUATIC COMMUNITY AND THE QUALITY OF NATURAL WATERS, Oregon State Univ., Corvallis. Water Resources Research Inst. For primary bibliographic entry see Field 04C. W73-10411

SEDIMENT TRANSPORT BY STREAMS DRAINING INTO THE DELAWARE ESTUARY, Geological Survey, Philadelphia, Pa. L. J. Mansue, and A. B. Commings. Geological Survey open-file report, 1973. 30 p, 2 file. 5 (b.h.) 2 mf fig. 5 tab, 18 ref.

Descriptors: "Sediment transport, "Sediment yield, "Sediment load, "Delaware River, Environmental effects, Urbanization, Urban hydrology, Data collections, Geology, Topography, Land use, Suspended solids, Sedimentation, Erosion, Riverse, Paradyseries, Pa Suspended solids, Sedimentation, Eastern, basins, Watershed management, Pennsylvan New Jersey, Delaware.
Identifiers: *Delaware River basin.

Identifiers: *Delaware River basin.

The quantity of sediment transported by streams draining into the Delaware estuary from Pennsylvania, New Jersey, and Delaware varies really according to geology, physiography, and land use. Of the estimated total sediment load of 1.6 million tons entering the Delaware estuary annually, about 49% is contributed by the Delaware River main stem, 34% by Pennsylvania tributaries, and 17% by New Jersey and Delaware tributaries, and 17% by New Jersey and Delaware tributaries. The highest sediment yielding basins are in the Piedmont province in Pennsylvania and Delaware, where sediment yields range from 100 to 1,000 tons per sq mi annually. Inner Coastal Plain basins in New Jersey and Delaware have a sediment yield of from 50 to 250 tons per sq mi annually. Basins carrying the least sediment per square mile are located in the outer coastal plain in southern New Jersey and Delaware. Yields in these stream basins range from 5 to 10 tons per sq mi annually. Streams' draining areas in the development phases of urbanization, where exposure of soils by earthmoving related to highway or new housing construction, have yields two to four times higher than those in adjacent nonurban or stable urban areas. (Woodard-USGS)

DEEP WATER RENEWAL IN SAANICH INLET, AN INTERMITTENTLY ANOXIC BASIN, Washington Univ., Seattle. Dept. of Oceanog-

For primary bibliographic entry see Field 05B. W73-10432

MATHEMATICAL SIMULATION OF TIDAL TIME-AVERAGES OF SALINITY AND VELOCITY PROFILES IN ESTUARIES, VELOCITY PROFILES IN ESTUARIES, Massachusetts Inst. of Tech., Cambridge. J. S. Fisher, J. D. Ditmars, and A. T. Ippen. Available from NTIS, Springfield, Va. 22151 as COM 73-10053 Price \$3.00 printed copy; \$0.95 microfiche. Massachusetts Institute of Technolo-gy Sea Grant Project Office Report MITSG72-11, July 31, 1972. 193 p, 40 fig, 21 tab, 27 ref, 3 ap-pend. NOAA Grant GH-88 and 2-35150.

Descriptors: *Saline water intrusion, *Estuaries, *Mathematical models, *Tidal effects, Velocity, Salinity, Flow profiles, Flow rates, Flumes, Inputoutput analysis, Equations, Correlation analysis, Saline water-freshwater interfaces, Analytical techniques.

A mathematical model is developed using analytical techniques to determine the longitudinal and vertical distributions of velocities and salimites, averaged over a tidal period, for mixed but partially stratified estuaries. The flow field is assumed averaged over a usual period, for mixed but partially stratified estuaries. The flow field is assumed laterally homogeneous and the estuary width and depth are assumed to be functions of the longitudinal coordinate only. Required inputs to the model include the salt intrusion length, the ocean boundary salinity, and the freshwater discharge. The governing equations are the vertical and longitudinal equations of motion, continuity, salt conservation, and an equation of state. The key assumption is that the longitudinal salinity gradient is independent of depth. This decouples these equations and thus permits an analytical solution. Using data from laboratory flume tests from the U. S. Army Waterways Experiment Station and the Delft Hydraulics Laboratory, and field surveys from the James River Estuary in Virginia, the model solutions are used to find correlations for the mean vertical transfer coefficients of mass and momentum with gross characteristics of the estuary. These correlations, plus the results from a one-dimensional numerical model, permit this analyti-cal model to be used as a predictor of the velocity and salinity profiles in estuaries and to relate changes in freshwater discharge to possible changes in the location of shoaling zones. (Woodard-USGS)

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA, Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
For primary bibliographic entry see Field 05B.

THE EVOLUTION OF LEWES HARBOR, Delaware Univ., Newark. Dept of Geology. For primary bibliographic entry see Field 02J. W73-10438

A TWO-LAYER MODEL OF MUD TRANSPORT IN THE THAMES ESTUARY, Hydraulics Research Station, Wallingford (En-(be

gland). N. V. M. Odd, and M. W. Owen. Institution of Civiel Engineers Proceedings Paper 7517 S, Supplement 9, 1972. 30 p, 13 fig. 1 tab, 17

Descriptors: *Sediment transport, *Mud, *Estuaries, *Stratified flow, *Mathematical models, Saline water intrusion, Saline water-freshwater interfaces, Density stratification, Tides, Currents terfaces, Density stratification, Tides, Currents (Water), Mixing, Suspended load, Flood control, Dams. Identifiers: *Thames Estuary (England).

A two-layer mathematical model simulates mud transport in a well-mixed estuary. The main pur-pose of the model is to simulate mud transport processes and the effects on the regime of siltation of continuous operation of various tidal barriers proposed for flood protection in the Thames Estuary. A method is given for calculating two layer tidal flow with internal gravitational circulation induced by density gradients. Methods for cal-culating the rates of erosion and deposition of mud are based on field and laboratory experiments. The application of the method characteristics is used to solve the mass balance equations for the transport of mud suspended in two-layer flow. (Knapp-USGS) W73-10443

TRACER SIMULATION STUDY OF POTEN-TIAL SOLUTE MOVEMENT IN PORT ROYAL SOUND, SOUTH CAROLINA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05B. W73-10446

MARINA DEL REY: A STUDY OF ENVIRON-MENTAL VARIABLES IN A SEMI-ENCLOSED COASTAL WATER, University of Southern California, Los Angeles. Environmental Engineering Program. For primary bibliographic entry see Field 05B. W73-10465

(CALIFORNIA COMPREHENSIVE OCEAN AREA PLAN). APPENDIX I: PERMANENT COASTAL ZONE DATA INVENTORY AND IN-FORMATION SYSTEM, California State Dept. of Navigation and Ocean

Development, Sacramento.
For primary bibliographic entry see Field 07C.

POLLUTION IN SOME BRITISH ESTUARIES AND COASTAL WATERS. Royal Commission on Environmental Pollution, London (England). For primary bibliographic entry see Field 05B. W73-10554

PROCEEDINGS OF THE 1971 OSTAC ANNUAL MEETING, STATE DEPARTMENT, WASHING-TON, D.C. 2-3 JUNE 1971.
For primary bibliographic entry see Field 05G. W73-10570

DEPARTMENT OF INTERIOR PROGRAM, Bureau of Outdoor Recreation, Washington, D.C. For primary bibliographic entry see Field 05G. W73-10571

FEDERAL INTERACTION WITH STATES, Virginia Inst. of Marine Sciences, Gloucester Point. For primary bibliographic entry see Field 05G. W73-10572

LONG ISLAND'S APPROACH TO ENVIRON-MENTAL QUALITY, Ocean Systems, Inc., Reston, Va. For primary bibliographic entry see Field 05G.

DELAWARE MARINE RELATED STUDY, Hercules, Inc., Wilmington, Del. For primary bibliographic entry see Field 05G.

THE GULF ENVIRONMENTAL PROGRAM, Gulf Universities Research Corp., Galveston, For primary bibliographic entry see Field 05G. W73-10575

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REPORT OF STUDY ON SHIPS CHANNELS

AND HARBORS,
American Association of Port Authorities,
Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-10576

CALIFORNIA'S MARINE PROGRAM, Modern Management, Beverly Hills, Calif. For primary bibliographic entry see Field 05G. W73-10577

CHEMICAL PANEL REPORT, Union Carbide Corp., New York. For primary bibliographic entry see Field 05G. W73-10578

OCEAN UTILIZATION AND COASTAL ZONE DEVELOPMENT.
Massachusetts Inst. of Tech., Cambridge. Sea
Grant Project Office.

Report No MITSG 73-3, 1973. 29 p, 12 ref. NOAA GH-88.

Descriptors: *Coasts, *Resources, *Management, Research, Engineering, Education, Harbors, *Estuaries, Model studies, Transportation, Mineralogy, Proteins, Oil, Oxidation, Bacteria, *Water pollution control, Resource development. Identifiers: Sea Grant activities.

Sea grant activities of the Massachusetts Institute of Technology from June 1, 1970 to June 30, 1972 are summarized. Research projects include: new dimensions of U.S. marine policy, estuary modeling, ocean transportation, the future of Atlantic ports, squid protein concentrate; and oil oxidation by marine bacteria. Education and training pro-jects encompass: power, pollution, and public pol-icy; ocean engineering; marine transportation; and evolution and utilization of marine mineral resources. (Ensign-PAI) W73-1673

A PROTOTYPE TOTALISING CURRENT-M-ETER (MARK II); A SELF-MOORED VERSION FOR NEAR-SURFACE USE ESPECIALLY IN FOUL WATER ESTUARIES IN CONNECTION WITH POLLUTANT DISPERSAL STUDIES, National Inst. of Oceanography, Wormley (Enland). ary bibliographic entry see Field 05B. For primary W73-10580

COASTAL EROSION IN THE NILE DELTA, United Nations Educational, Scientific and Cul-tural Organization, New York. For primary bibliographic entry see Field 02J. W73-10681

A STUDY OF THE PROBABLE EFFECTS OF THE DIVERSION OF FLOOD WATERS UPON THE ECOLOGY OF THE CONNECTICUT
RIVER ESTUARY,

RIVER ESTUARY,
Connecticut Univ., Storrs.
M. J. Westerfield, and W. C. Kennard.
In: Formation of Public Policy on Issue of Out-ofState Basin Diversion of Connecticut River Flood
Waters to Boston Metropolitan Area, Massachusetts Water Resources Research Center,
Publication No. 25, 1973, Appendix F, 23 p, 3 fig, 1
tab, 42 ref. OWRR C-2169 (No. 3377) (1).

Descriptors: "Ecology, "Estuarine environment, Water quality, Flood flows, "Diversion, Tempera-ture, Salinity, Nutrients, Turbidity, Zooplankton, Phytoplankton, Ecosystem, "Inter-basin transfers. Identifiers: "Connecticut River Estuary.

The ecology of the Connecticut River estuary and the possible effects of the diversion of flood the possible effects of the diversion of flood waters out of the basin are described. Emphasis is placed on describing the predominant charac-teristics of the ecosystem in the tidal stretch of the Connecticut River, including its bacteriology, phytoplankton, zooplankton, and fish populations; identifying factors such as river flow, salinity, identifying factors such as river flow, salinity, temperature, turbidity, and nutrients which are key determinants of the nature of the ecosystem; and predicting possible changes in these factors as a result of the flood water diversions. Several changes such as higher temperatures, increased salinity, decreased flows and water currents, and more deposited solids are discussed. Each of these amore deposited solids are discussed. Each of these changes by itself may not be significant but the combined effect may significantly change the estuarine ecosystem. However, a thorough study of the estuary is needed before a proper evaluation can be made. (See also W73-10726). (Elfers - North Carolina). W73-10732

SHELF SEDIMENT TRANSPORT: PROCESS AND PATTERN. For primary bibliographic entry see Field 02J. W73-10746

PREDICTING INITIAL MOTION AND BEDLOAD TRANSPORT OF SEDIMENT PAR-TICLES IN THE SHALLOW MARINE EN-VIRONMENT, Washington Univ., Seattle. Dept. of Oceanog-cepts.

raphy.
For primary bibliographic entry see Field 02J. W73-10749

OBSERVATIONS ON WIND, TIDAL, AND DENSITY-DRIVEN CURRENTS IN THE VICINITY OF THE MISSISSIPPI RIVER DELTA, Louisiana State Univ., Baton Rouge. Coastal Studies Louisiana S dies Inst. For primary W73-10752 ary bibliographic entry see Field 02J.

MIGRATION OF TIDAL SAND WAVES IN CHESAPEAKE BAY ENTRANCE, Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.

For primary bibliographic entry see Field 02J. W73-10765

WATER CIRCULATION AND SEDIMENTA-WALER CIRCULATION AND SEDIMENTA-TION AT ESTUARY ENTRANCES ON THE GEORGIA COAST, Skidaway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 02J. W73-10766

LINEAR SHOALS ON THE ATLANTIC INNER CONTINENTAL SHELF, FLORIDA TO LONG ISLAND, Army Coastal Engineering Research Center, Washington, D.C. For primary bibliographic entry see Field 02J. W73-10768

NEARSHORE SEDIMENTARY PROCESSES AS GEOLOGIC STUDIES, Skidaway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 02J.

DYNAMICS OF MINERAL AND ORGANIC PHOSPHORUS IN THE SEA OF AZOV AFTER, REGULATION OF DON RIVER FLOW (DINAMIKA MINERAL'NOGO I ORGANICHESKOGO FOSFORA V AZOVSKOM MORE POSLE ZAREGULIROVANIYA STOKA REKI DONA), Basseinovaya i Gidrometeorologicheskaya Obser-vatoriya Chernogo i Azovskogo Morei, Sevastopol (USSR).

For primary bibliographic entry see Field 02K. W73-10782

STUDY ON THE ACOUSTIC CHARAC-TERISTICS OF UNDER-WATER: FLOATING MUD-1, (IN JAPANESE), Tokai Univ., Tokyo (Japan). Coll. of Marine Science and Technology. For primary bibliographic entry see Field 05B. W73-10803

A COMPARISON OF MICROARTHROPOD POPULATIONS IN SEWAGE-EXPOSED AND SEWAGE-FREE SPARTINA SALT MARSHES, North Carolina Univ., Chapel Hill. Dept. of Zoolo-

gy. For primary bibliographic entry see Field 05C. W73-10814

HEAVY METALS IN BRITISH WATERS Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab. For primary bibliographic entry see Field 05B. W73-10851

ORGANIC MERCURY COMPOUNDS IN COASTAL WATERS, Connecticut Univ., Groton. Marine Sciences Inst. For primary bibliographic entry see Field 05A.

Field 02-WATER CYCLE

Group 2L—Estuaries

THE DISTRIBUTION OF HEAVY METALS IN SEDIMENTS OF SORFJORD, WEST NORWAY, Edinburgh Univ. (Scotland). Grant Inst. of Geolo

For primary bibliographic entry see Field 05B. W73-10865

ECOLOGICAL SIGNIFICANCE OF THE DISCHARGE OF TREATED WASTE WATERS INTO COASTAL WATERS, Southern California Coastal Water Research Project, Los Angeles. For primary bibliographic entry see Field 05C. For primary W73-10876

PRODUCTIVITY PROBLEMS OF FRESH-Polish Academy of Sciences, Warsaw. Inst. of For primary bibliographic entry see Field 05C.
W73-10895

DIURNAL VERTICAL MIGRATION OF AN ESTUARINE CLADOCERAN, PODON POLYPHEMOIDES, IN THE CHESAPEAKE BAY, Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst. H. P. Bosch, and W. R. Taylor. 1972, 29 P. 7 FIG, 19 REF. AEC AT (30-1)3497 and

Descriptors: *Diurnal, *Vertical, *Migration, *Estuaries, *Crustaceans, Chesapeake Bay, Zooplankton, Tides, Light, Currents (Water). Identifiers: *Podon polyphemoides.

Quantitative pump samples of Chesapeake Bay zooplankton, made to determine whether the cladoceran, Podon polyphemoides, changed its position in the water column with respect to time, indicated that a downward migration occurred shortly before sunset and an upward migration before dawn. A similar three day study a year later confirmed the results and showed that the podonids (all asexual females) were not impeded in their migration by saline or pycnal stratification. The level to which the population rises within the water column may be dictated by ambient light. Day and night plankton samples taken along the axis of the bay showed the vertical migratory pattern of the podonids to be a general phenomenon throughout the estuary. It is thought that the downward component of the migration, shown to be diurnal behaviour and independent of the tidal downward component of the migration, shown to be diurnal behaviour and independent of the tidal cycle, is due to passive sinking attending a decrease in swimming activity. The vertical migra-tion of the podonids from the upper part of the two-layered circulation during the night returns in-dividuals advected seawards during the day. This behaviour is probably an important factor in allow-ing this species to maintain its large populations. ing this species to maintain its large populations within the dynamic estuarine environment. (Jones-

TRACE METALS IN CORES FROM THE GREAT MARSH, LEWES, DELAWARE. Delaware Univ., Newark. Dept. of Geology. For primary bibliographic entry see Field 02J. W73-10971

COMPARATIVE CARBOHYDRATE GEOCHEMISTRY OF BAY, SALT MARSH, AND DEEP GULF SEDIMENTS, AND DEEP GULF SEDIMENTS,
Delaware Univ., Newark.
F. M. Swain, and J. M. Bratt.
Available from NTIS, Springfield, Va 22151 as
COM-73-10205 Price 33.00 printed copy; \$0.95
microfiche. College of Marine Studies Report
DEL-SG-11-72, December 1972. 13 p, 7 tab, 7 ref.
(Reprint from Advances in Organic Chemistry, p
415-425, 1971). NOAA Grant GH-109. Descriptors: *Sediments, *Carbohydrates, *Bays, Sampling, Data collections, Marshes, Gulfs, Coasts, Delaware, New Jersey, Mexico, Correlation analysis, Evaluation, Geochemistry, Bottom sediments, Organic compounds.
Identifiers: *Bottom sediment sugars.

Carbohydrate components of cores of sediments from Broadkill Marsh, Delaware, Delaware Bay, and from 1,210 fathom depth in the southern Gulf of California include a variety of free sugars and or Cantornia include a variety of tree sugars and polymeric sugars, the latter including small amounts of recognizable polysaccharide structures. Free sugars in peat and tidal-marsh silts of Broadkill Marsh form generally 5% or less of the total sugars and consist mainly of glucose. In the fine silty and clayey sands of lower Delaware Bay glucose also is the principal free sugar but com-prises 20%-50% or more of the total extractable sugars. Free sugars in the radiolarian-diatom-foraminiferal clays of the Gulf of California are richer than in the marsh and bay sediments but are only 1%-2% of the total sugars in the gulf sedionly 1%-2% of the total sugars in the gulf sediments. Monosaccharides extracted with acid from these sediments probably occurred in some polymeric form but mainly not as identifiable polysaccharides. In the Boradkill Marsh silts and peat such sugars range from 0.2 to 6.8 mg/g and include galactose, clucose, mannose, arabinose, xylose, ribose, rhammose, and rarely maltose. Diatoms, marine algae and marsh grasses (Distichlis, Spartina, and Phragmites) have been the principal source material. Polymeric sugars in Delaware Bay sediments are less than in the marsh grasses debris, marine algae, and diatoms also appear to have been the source for the bay sediment sugars. The polymeric sugars of Gulf of California sediments average quite high and range from 1.8 to 3.4 mg/g. The source of this material is apparently settled plankton and perhaps some contribution settled plankton and perhaps some contribution from land plants that have floated to sea. The preservation of so much carbohydrate material in the deepwater sediments is surprising in view of the distance it has to settle. (Woodard-USGS) W73-10972

TIDAL CURRENTS AND ZIG-ZAG SAND SHOALS IN A WIDE ESTUARY ENTRANCE, Old Dominion Univ., Norfolk, Va. J. C. Ludwick.

J. C. Ludwick.
Available from NTIS Springfield, Va 22151 AD755 735, Price \$3.00 printed copy; \$0.95 microfiche. Institute of Oceanography Technical Report No 7, January 15, 1973. 102 p, 22 fig, 9 tab, 44 ref, 3 append. ONR-GP Contract N00014-70-C-

Descriptors: "Sedimentation, "Inlets (Waterways), "Estuaries, "Chesapeake Bay, "Tidal effects, Tides, Flow rates, Sediment transport, Sediment distribution, Shoals, Environmental effects, Levees, Data collections.

Fourteen 27-hour tidal current stations were mainsquared in the entrance to Chesapeake Bay in a 40 sq mi area of subtidal sand banks and channels where the average water depth is 21 feet. At ebb strength, surface current speed ranged from 4.33 to 2.11 ft/sec; near-bottom speed ranged from 2.56 to 0.73 ft/sec. At flood strength, surface current speed ranged from 3.43 to 1.86 ft/sec; near-bottom speed ranged from 2.12 to 1.15 ft/sec. Near the speed ranged from 2.12 to 1.15 th sec. Near the bottom at most stations, floodflow dominates over ebb flow in both peak speed and duration. Net transport of bed sediment is generally ebb directed. Zig-zag shoals extend from the north cape, three-fourths of the distance to the south across the entrance. This line of shoals is comprised of oppositely opening sinuses, or parabolas, which are with distance to the south alternately ebb dominated and flood dominated. The shoals represent spit building action in the presence of strong reversing tidal currents. Other shoals in the entrance are due to subaqueous levee building marginal to main channels. Still other shoals in the entrance are constructed when a flood-dominated channel intersects the ebb-directed path of net sediment transport, the entrapped sediment then being flushed landward to form a secondary shoal when spreading of the flood current occurs. (Woodard-USGS) W73-10982

MICROBIAL COMMUNITY STRUCTURE IN CONTAMINATED ESTUARIAN SEDIMENTS, North Texas State Univ., Denton. For primary bibliographic entry see Field 05C. W73-11025

OBSERVATIONS ON THE TRANSPARENCY OF THE WATERS OF THE PULICAT LAKE WITH PARTICULAR REFERENCE TO PLANK-TON PRODUCTION, Central Inland Fisheries Research Inst., Madras (India).

For primary bibliographic entry see Field 05C. W73-11046

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DESALINATION PLANT, Auscoteng Pty Ltd., Wayville, (Australia). (assignee). N. L. Foley.
U. S. Patent No. 3,725,206, 3 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office,

Vol 909, No 1, p 301, April 3, 1973.

Descriptors: *Patents, *Desalination, *Evapora-tors, *Condensation, *Heat exchange, Seawater, Brine, Separation techniques, Potable water,

This desalination plant comprises an evaporator having a condenser within it for heat exchange purposes. The water to be desalted is drawn by purposes. In water to be desaited is drawn by means of a low pressure system from a supply tank through a heat exchange tank. The water finally enters the evaporator through an air separa-tion chamber. The air separation chamber is con-nected by a line and a heat exchanger to a brine pump. The pump serves to draw off any air which enters the system with the water and at the same time draws off a quantity of brine. A blower is used to provide heat of compression and to establish a vapor flow from the evaporator to the condenser and to establish a lesser degree of high vacuum within the condenser so that the latent heat of vaporization of a fluid condensing will flow from the condenser into the saline water. (Sinha-OEIS)

MULTIPLE EXPANSION FLASH EVAPORA TOR COMPRISING A CONTINUOUS CASING WITH A CENTRAL EVAPORATION CHAMBER,
Societa Italiana Resine S.p.A, Milan (Italy). (as-

signee; D. Barba, C. D'Agostino, and G. Liuzzo. U. S. Patent No 3,720,586, 2 p, 3 fig, 10 ref; Offi-cial Gazette of the United States Patent Office, Vol 908, No 2, p 427, March 13, 1973.

Descriptors: *Patents, *Desalination, *Condensa-tion, Sea water, Potable water, Evaporation, Water treatment, Equipment, *Heat exchangers, *Flash distillation. Identifiers: *Evaporation chambers.

A multiple expansion flash evaporator comprises a continuous casing, vertical longitudinal baffles dividing the casing into a central evaporation zone

and two side condensation zones in communica-tion with the central zone. A number of vertical transverse baffles divides the evaporator into a succession of expansion chambers with flow openings between them. A multi-tube heat exchanger runs the length of each condensation zone. (Sinha-OEIS)

3B. Water Yield Improvement

PREDICTING DEGREE DAY SNOW MELT FACTORS WITH CROWN CLOSURE IN ARIZONA PONDEROSA PINE, Arizona Univ., Tucson. Dept. of Watershed

Management.
For primary bibliographic entry see Field 02E.
W73-10697

WOODY PHREATOPHYTES ALONG THE BRAZOS RIVER AND SELECTED TRIBUTA-RIES ABOVE POSSUM KINGDOM LAKE, Texas Tech Univ., Lubbock. Dept. of Range and ldlife Manager

Winding Management. F. E. Busby, Jr., and J. L. Schuster. Texas Water Development Board, Austin, Report 168, April 1973. 41 p, 12 fig, 6 tab, 15 ref, 6 append.

Descriptors: *Water loss, *Phreatophytes, *Texas, *Arid lands, Data collections, Aerial photography, Remote sensing, Aircraft, On-site investigations, Correlation analysis, Meteorological data, Precipitation (Atmospheric), Evaporation, Temperature, Vegetation, Cottonwoods, Mesquite, Rivers, Lakes, Flood plains, Water yield improvement, Soil-water-plant relationships. Identifiers: *Brazos River (Tex), Possum Kingdom Lake, *Saltcedar.

In the arid western part of Texas, phreatophytes along streams remove large quantities of water from a very limited supply. The increase in area and density of these plants over the years, and the resultant increase in their water consumption, are of concern to the Texas Water Development Board. Woody phreatophyte vegetation was inventoried along the Brazos River upstream from Possum Kingdom Lake to the confluence of the Double Mountain and Salt Forks. The kinds, amounts, distribution, history of spread, and volume density of the phreatophytes were determined along with their relation to flood-plain location. Saltcedar is the most widely distributed phreatophyte in the study area, and usually occurs phreatophyte in the study area, and usually occurs in a dense stand adjacent to the river channel. It in a dense stand adjacent to the river channel. It dominated 18 precent of the river flood plain in 1940, increasing to 28 percent in 1950 and 36 percent in 1969. Mesquite occurs on the outer portion of the flood plain, and occurs extensively where the flood plain is wide. It has spread slightly toward the river channel, invading 760 additional acres from 1940 to 1969. Average volume density 1778, and total growth is equivalent to 2.181 is 27%, and total growth is equivalent to 2,181 acres at 100% volume density. (Woodard-USGS) W73-10745

CONVERTING CHAPARRAL TO GRASS TO

INCREASE STREAMFLOW,
Forest Service (SDA), Tucson, Ariz. Rocky
Mountain Forest and Range Experiment Station.

Mountain Fores and Valence Assessment of the P. A. Ingebo.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Asses, and the Hydrology Section, Advance Asses, and The Science May 5-6, 1972. Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 181-192, 1972. 5 fig.

Descriptors: *Chaparral, *Grasses, *Streamflow, *Water supply, *Water harvesting, Surface waters, Watershed management, Forest manage-ment, Rainfall-runoff relationships, Treatments, Arizona, Arid lands.

Chaparral covers 4 million acres in Arizona. There is interest in determining how much these lands contribute to surface water supply, and how this contribution could be changed by conversion of chaparral cover to grass or grass forb. Results from treatment in the Whitespar watersheds are interpreted. Live oak and true mountain mahogany dominate the study area, which averages 22.7 inches of annual precipitation. Whitespar B watershed was converted to grasses in 1967, and litter was not disturbed. The 246 acre watershed produced more streamflow than the untreated, 303-acre control which tended to remain intermitent. Prior to treatment, streamflow in both watersheds was quite well synchronized. Watershed B has since had continual flow. Winter flows contribute about 77 percent of the increased streamflow youture. The degree of effect is still under study, but a new rainfall-runoff relationship for the treated watershed is necessitated. (See also W73-10831 (Popkin-Arizona)

WEATHER MODIFICATION IN ARIZONA,

1971, Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center. H. B. Osborn.

H. B. Osborn.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 193-207, (1972). 14 ref.

Descriptors: *Weather modification, *Thun-derstorms, *Cloud seeding, *Analysis, *Clouds, Winds, Rainfall, Precipitation (Atmospheric), Arizona

There have been many efforts in recent years to modify thunderstorms through cloud seeding. Collective cloud seeding efforts in Arizona before 1971 are reviewed and an operational convective cloud seeding program carried out in Arizona in the summer of 1971 is analyzed. The comprehensive Santa Catalina Cloud Seeding Experiment (1957 to 1964) was a randomized seeding using silver iodide. Results of this experiment are uncertain as numerous interpretations are possible. Nusilver iodide. Results of this experiment are uncer-tain as numerous interpretations are possible. Nu-merous individual experiments from 1966 to 1970 at Flagstaff were conducted, with uncertain results. An intensive program of seeding individual cumulus clouds with silver iodide was carried out cumulus clouds with silver iodide was carried out in the summer of 1971 in central and eastern Arizona. No statistically significant changes were noted. Results of the Catalina Experiment imply that seeding decreased rainfall on and downwind from the target. Two other experiments were inconclusive. Nine figures show precipitation patterns. (See also W73-10818) (Popkin-Arizona)

AQUATIC PLANT CONTROL PROGRAM. Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 04A. W73-10931

MECHANICAL EQUIPMENT USED FO AQUATIC PLANT CONTROL IN LOUISIANA, Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 04A. W73-10952

INVESTIGATIONS CURRENT JACKSONVILLE DISTRICT CONCERNING
MECHANICAL HARVESTING OF OBNOXIOUS

AQUATIC PLANTS,
Army Engineer District, Jacksonville, Fla.
Aquatic Plant Control Section; Florida Dept. of
Natural Resources, Tallahansee; and Florida State
Game and Fresh Water Fish Commission, Tal-

For primary bibliographic entry see Field 04A.

W73-10953

AQUATIC PLANT CONTROL IN THE PANAMA Corps of Engineers, Philadelphia, Pa. Operations

For primary bibliographic entry see Field 04A. W73-10954

BENEFICIAL AQUATIC PLANTS IN COASTAL AREAS.

Army Engineer District, Mobile, Ala H. McClellan.

H. McCenan.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 31-36, 1972. 5 ref.

Descriptors: "Aquatic plants, "Estuaries, "Tidal marshes, "Coastal marshes, Productivity, Algae, Bacteria, Periphyton, Diatoms, Ecosystems, Biological communities, Florida, Mangrove swamps, Benthic flora, Detritus, Bayous, Plant populations, Grasses. Identifiers: "Atlantic coast, "Gulf coasts, Sea grass heds."

Coastal zone plants whose productivity is due to autochtonous material are described. Along the edge of the coastal zone is the tidal marsh, a most dynamic unit of nature. The marsh also functions for many purposes, including dumping, industries, boat channels, meadow hay, mosquitoes, spawning, fish food factories, spots for waterfowl, and beautiful shore scenes. On the Atlantic and Gulf coasts, the grasses, Spartina alterniflora and S. patens, dominate. The first grows where currents are strong and the latter, used as hay, forms a carpet on the flats. The black rush, Juncus roemerianus, forms broad expanses on high marsh in southern areas and J. gerardii in northern marshes. Distichlis spicata, a short fine grass, grows in more waterlogged spots of high marsh; Salicornia lives on the salt marsh proper. In south Florida, mangrove begins to replace Spartina. On bottoms of ponds and bayous occur benthic algae and bacteria whose nitrogen-fixing is important. Benthic algae are grazed by herbivorous fishes. Sea grass beds afford cover for organisms. Actually the detritus is of major importance within the coastal zone. Caostal zone plant control should be approached cautiously. (See also W73-10951) (Jones-Wisconsin)

MECHANICAL EQUIPMENT 'WEED WITCH' FOR AQUATIC PLANT CONTROL, Army Engineer Div. South Atlantic, Atlanta, Ga. J. J. Raynes.

In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 37-39, 1972.

Descriptors: *Aquatic weed control, *Mechanical equipment, Maryland, Turbidity, Operating costs, Construction costs, Performance. Identifiers: *Weed Witch', Severn River (Md).

The "Weed Witch' is a piece of mechanical equipment for controlling aquatic vegetation; by disturbing the bottom sediment, it uproots the vegetation. It consists primarily of pumps connected to a multiple header system of vertical plastic pipes terminating in high pressure jets or spray heads adjusted as needed for positioning near the river bottom. The uprooted plants generally float and are moved out by river currents. The pertinent structural facts, the costs of operation and construction, the method of operation, and effectiveness are given. It is not without operation and construction, the method of opera-tion, and effectiveness are given. It is not without limiting factors, for it requires relatively flat bot-toms without underwater obstructions such as stumps, debris, and piles. The disposal of uprooted aquatics could create problems if al-lowed to disperse by natural currents or to deposit on shore, particularly in highly populated and

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3B-Water Yield Improvement

developed areas. Fragments of many of the un-derwater aquatic plants will spread and create new colonies of growth unless they are in close prox-mity and are transported by river currents to high saline waters which are generally toxic to most problem aquatic plants. In operation, the stirring of the bottom causes the water to become very tur-bid and muddy. (See also W73-10951) (Jones-Wisconsia)

SUMMARY OF CO2 LASER-WATER HYACINTH LABORATORY RESEARCH, Athens Coll., Ala. Dept. of Biology.

P. W. Couch

R. W. COUCH.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 41-45, 1972.

Descriptors: *Aquatic weed control, *Radiation, Water hyacinth, Electromagnetic waves, Light intensity, Plant morphology, Pigments, Irradiation, Plant growth, Photosynthesis, Chlorophyll,

Identifiers: *Carbon dioxide laser. Hill reaction. Neodymium laser, Duckweed, Laser,

A nitrogen-carbon dioxide-helium laser system for A nurogen-caroon dioxide-helium isser system for control of aquatic weed growth was demonstrated. Water hyacinth plants were most affected. No anatomical damage could be found in either fresh nor in prepared stained sections, although there seemed to be a faster disintegration of tissues asseemed to be a faster disintegration of tissues as-sociated with the plant's photosynthetic mechanism than for surrounding tissues. Several trends were apparent. Both plant counts and dry matter wrights led to the conclusion that at least 0.5-joule/sq cm carbon dioxide laser energy was necessary to obtain inhibition of plant growth. The C-14 dioxide-fixation studies showed the lower threshold of energy necessary for plant growth in-hibition was somewhat higher than the 0.5-joule/sq cm rate, but less than 4.4-joule. Evidence showed that reirradiation did not appreciably improve concm rate, but less than 4.4-joule. Evidence showed that reirradiation did not appreciably improve control. Physiological studies showed that the laser radiation was inhibiting light reaction phase of photosynthesis rather than dark reaction phase. Reduction was apparently brought about by inhibition of production of the photosynthetic pigments responsible for conversion of light energy to the production of the photosynthetic pigments was controlled to the production of the photosynthetic pigment was controlled to the production of the photosynthetic pigment was controlled to the production of the photosynthetic pigment was controlled to the production of the photosynthetic pigment was controlled to the production of the pro responsible for conversion of light energy to chemical energy. Another experiment was conducted with water hyacinths using a neodymium laser. The effects of 10.6 micron laser energy on duckweed indicated excellent control at the 10-joule/sq cm radiation rate. (See also W73-10951) (Jones-Wisconsin) W73-10957

FIELD LASER.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. J. L. Decell.

In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 47-50, 1972. 1 fig.

Descriptors: *Aquatic weed control, *Plant growth, *Water hyacinth, Inhibition, Prototypes, On-site tests, Costs, Nutrients, Irradiation, Plant physiology. Identifiers: Lasers. Waterways Experiment Sta-

A prototype of a field carbon dioxide laser is being planned to evaluate its control of water hyacinth growth. Two basic types were considered and the Electric Discharge Convection Laser proved to be more economical to construct and operate. Data have been analyzed in an effort to isolate the variables contributing to growth reduction of the irradiated water hyacinths. A validated growth curve has been generated from a separate data source and an equation has been written for this curve. Using this curve as a base of reference, comparisons are being made with data from the

Athens College, Alabama, experiments to determine the magnitude of influence of certain variables that are believed to be contributing to the reduction in growth. The final result of this analysis will be a multiple regression equation that considers the following variables: number of dead plants, regeneration, dry matter weight, nutrient levels, and radiated energy. Outside of studies dealing with the water hyacinth's physiology, there is very little quantitative information that incites its reaction to varying environmental conditions. There still exists a need for some additional basic laboratory experiments to augment data from the Athens-Redstone experiments. (See also W73-10951) (Jones-Wisconsin)

AQUATIC PLANT CONTROL RESEARCH PRO-JECT PLAN FY 73-77 (PPB REPORT), Corps of Engineers, Washington, D.C. E. O. Gangatad.

In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p B3-B12, 1972.

Descriptors: "Aquatic weed control, "Project planning, "Project purposes, "Project benefits, "Inland waterways, Eutrophication, Aquatic plants, Planning, Control, Rivers and Harbors Act, Conservation, Legislation, Environment, Research and development, Herbicides, Harvesting, Mechanical equipment, Insects, Forage fish, Estimated costs, Plant diseases.

Identifiers: Eradication, Laser, Plant utilization, Plant netheges.

The Army Corps of Engineers' project titled 'Integrated Mechanical, Chemical, and Biological Control Systems for Aquatic Plants' is described Control Systems for Aquatic Plants is described fully. Under 'Problem Requiring Research' are listed obnoxious plants in coastal and inland waterways, statement of the problem, present procedures and possible improvement. Under 'Impacts' are listed an impact matrix, research and plan schedule, surveys, sequence of tasks, work accomplished by others, controlled-release herbiaccompanies of others, controlled-release herbi-cides, control by laser, plant utilization, mechani-cal harvest, aquatic plant insects, aquatic plant pathogens, herbivorous fish, execution capability, nitude of Payoff' various control methods are described, cost estimates and man-years are presented for 1973-1977, significant dates in project scheduling, progress and accomplishments through 1972, and alternative funding schedules. (See also W73-10951) (Auen-Wisconsin) W73-10959

INTEGRATION OF BIOLOGICAL AND CHEMI-CAL CONTROL OF ALLIGATOR WEED, Agriculture Research Center, Fort Lauderdale,

Fla.

R. D. Blackburn, and W. C. Durden.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p C3-C17, 1972.
2 fig, 3 tab.

Descriptors: *Biocontrol, *Integrated control measures, *Alligatorweed, *Aquatic weed control, Herbicides, Plant growth, Insects, Georgia, 2-4-D, Diquat, Florida, Laboratory tests, Chemcontrol, Rates of application Identifiers: Agasicles, Savannah (Ga), Jackson-

It has been demonstrated that the alligator weed It has been demonstrated that the anigator weed flea beetle (Agasicles sp.) can severely damage the surface stems of floating alligator weed mats but it alone cannot completely control floating mats because it cannot feed on the submerged stems. Constant pressure must be applied on the surface vegetation to prevent carbohydrate buildup in subsurface stems. Field observations indicated low rates of herbicides, used in combination with bee

tles, can result in more severe and longer lasting damage to floating alligator weed mats than is attainable with either agent alone. Growth pool and field experiments were initiated to determine if there was a preference by the flea beetle for alligator weed treated with herbicides, and the effectiveness of the beetle on alligator weed with admixed the constitution of the provides, followed by introduction of beetles in the fall, resulted in reduction of surface alligator weed in drainage ditches. Spring application of herbicides suppressed alligator weeds for approximately four weeks. The ideal method of controlling aligator weed in late summer or early fall would be by treatment with a light herbicide application, insect damage on regrowth, and frost killing of regrowth. (See also W73-10951) (Jones-Wisconsin) W73-10960

AOUATIC PLANT PROBLEMS IN LOUISIANA.

AQUATIC PLANT PROBLEMS IN LOUISIANA, Army Engineer District, New Orleans, La. W. E. Thompson. In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p D3-D10, 1972.

Descriptors: *Water hyacinth, *Alligatorweed, *Louisians, Agustic weeds, Dispersion, Distribu-

The introduction of water hyacinth and alligator The introduction of water nyacinti an augator weed into the United States and a general description of the plants, their growth habits, and propagation are given. By 1898 practically all of the main bayous in southern Louisiana were badly infested, some bayous becoming completely blocked making rivers and streams unsafe for navigation, a hazard to fish, public health, and designer. To the average the are and infestation navigation, a nazard to list, public health, and drainage. To the present, the area and infestation intensity have steadily increased. Only a small per-centage of water hyacinths are killed by frost in southern latitudes and indications are that the plant is becoming acclimated in its creep northward. The water hyacinth is normally quickly northward. The water hyacinth is normally quickly affected by salt water, however there are some evidence that it is becoming accustomed to moderate salinity and plants grow fairly well in brackish waters. The alligator weed has spread from the bayous up into ditches and thence into cultivated lands. Farm machinery, suction dredges, and floods have aided in its dispersal. Any degree of water hyacinth infestation must be considered a heared due to its limitest densities. ered a hazard due to its limitless deposition considered a mazard due to in minutes experience of seeds and their long viability; any area once infested must be regarded as infested for a long period after the last plant has been removed. (See also W73-10951) (Auen-Wisconsin)

MECHANICAL HARVESTING OF WATER HYACINTH IN SHELL CREEK RESERVOIR, CHARLOTTE COUNTY, FLORIDA, Florida State Game Freshwater Fish Commission,

I. M. VanDyke.

J. M. VanDyke. In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p E5-E28, 1972. 3 fig, 12 tab, 11 ref.

Descriptors: *Aquatic weed control, *Mechanical Descriptors: "Aquatic weed control, "Mechanical equipment, "Harvesting, "Prototypes, "Water hyacinth, Reservoirs, Florida, Costs, Construction costs, Operating costs, Maintenance costs, Manpower, Operations. Identifiers: Shell Creek Reservoir (Fla.), Sarasota Weed and Feed, Inc.

Water hyacinth's fecundity and ability to form water nyacinus s technicity and ability to form mats and damage water quality make it the most economically and ecologically destructive aquatic weed in Florida. The study site for the prototype harvester was Shell Creek Reservoir, the municipal water supply for Punta Gorda, Florida. To reduce chemical control programs, a study was

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Domestic and Municipal Use—Group 3D

made for removal of hyacinths by a mechanical method and development of an effective and economically feasible harvester. The harvester studied, constructed by Sarasota Weed and Feed, Inc., is a stationary, land-based system designed to remove floating aquatic vegetation, specifically water hyacinth. Chemical data on the reservoir show that mechanical harvesting had little or no effect on the water quality. With improvements, the harvester's output should be greatly increased. With its log, cattails, and heavy hyacinths, Shell Creek Reservoir was a tough testing ground. All of the hyacinths were chopped, a costly and timeconsuming operation. The project was manued and equipped to find the limits of the harvester, not to achieve a low cost per ton or cost per acre figure. (See also W73-10951) (Jones-Wisconsin) W73-10962

EVALUATION OF AQUAMARINE CORPORA-TION MECHANICAL HARVESTER IN REMOVAL OF WATER HYACINTHS, ST. JOHNS RIVER, BLUFTON, FLA., Florida State Game Freshwater Fish Commission,

L. J. Touzeau. In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, Appendix p E31-E37,

Descriptors: "Aquatic weed control, "Mechanical equipment, "Evaluation, Cost analysis, On-site tests, Water hyacinth, Harvesting. Identifiers: St. Johns River (Fla.), Blufton (Fla.), Aquamarine Corp.

Aquamarine Corp.

A mobile water hyacinth harvesting machine, designed and built by the Aquamarine Corporation of Waukesha, Wisconsin, was evaluated during its test operation at St. Johns River, Blutton, Florida. The harvester was anchored to the shore for fixed site operation and utilized an airboat to push hyacinths to the machine. The specific equipment used and potential improvements to be made are listed. The relative truck operation time estimate gives 80% as time spent hauling the weeds to the disposal site and 20% operation time spent in loading, 66% of the harvester time was not utilized due to difficulty in feeding the hyacinths to the harvester. Minimum tonnage removed averaged 20 tons per hour. Estimates of cost breakdowns for the test evaluation, operation of the machine, and supplemental equipment are included. (See also W73-10951) (Auen-Wisconsin)

3C. Use of Water of Impaired Quality

CHLORIDE BALANCE OF SOME FARMED AND FORESTED CATCHMENTS IN SOUTHWESTERN AUSTRALIA, Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). For primary bibliographic entry see Field 02K. W73-10669

SALINE AND ORGANIC WATER POLLUTION, Arizona Univ., Tucson. Dept. of Soils, Water and

Arizona Univ., 1 ucson. Dept. of Sons, 1 accident Engineering.

H. L. Bohn, and G. V. Johnson.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 209-220, 1972, 11 ref.

Descriptors: *Water pollution, *Saline water, *Organic matter, *Water utilization, *Recycling, Freshwater, Recharge, Oceans, Reclamation, Besalination, Food abundance, Water supply, Nutrients, Wastes, Soils, Plants, Treatment.

Better use and recycling of fresh water, which often recharges the oceans, would reduce man's disruption of nature to increase his supply of potable water. The global distribution of water, desalination, water reclamation and recycling, the roles of soils and plants in recycling and urban misuse of water are discussed. Man can increase his supply of food and good fresh water by recycling and nutrient balance, which imply living off his wastes. Intimate involvement of soils and plants in the production of fresh water and food is clear. Soils and plants should be equally involved in converting our waste water into potable water and useful nutrients. Numerous examples of how this may be done and how it is being done are presented. (See also W73-10818) (Popkin-Arizona) W73-10833

COLLECTIVE UTILITY OF EXCHANGING TREATED SEWAGE EFFLUENT FOR IRRIGATION AND MINING WATER, Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.

S. C. Ko, and L. Duckstein.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p. 221-234, (1972). 11 ref. OWRR A-022-ARIZ (4).

Descriptors: *Sewage effluents, *Irrigation water, *Industrial water, *Groundwater mining, *Alternative planning, Water utilization, Social aspects, Economic impact, Groundwater resources, Wastes, Arizona, Economic efficiency, Model

The concept of collective utility is applied to a case study of alternative water resource utilization by providing a basis for comparing alternative uses of resources from the viewpoint of aggregate welfare. The exchange of sewage effluent for groundwater used by irrigation farmers, and the exchange of sewage effluent for groundwater used by processing and milling miners in Tucson, Arizona, are given as examples. Reviewed are collective utility concepts, case problems, definitions of problems, formulation of the model, and marginal change of collective utility. The first case has a collective utility of \$800,500-G, where G represents unquantifiable factors, such as the reduction in quality of living due to the odor if solid waste exchanges. The second case has a collective utility of \$175,000. Since it is likely that G will be on the order of \$1 million per year, the first exchange is preferable to the second. (See also W73-10834) (Popkin-Arizona) The concept of collective utility is applied to a

3D. Conservation in Domestic and **Municipal Use**

AN ECONOMIC EVALUATION OF A WATER-BASED URBAN TOURIST ATTRACTION IN SAN ANTONIO, TEXAS, Texas A and M Univ., College Station. Water Resources Inst. For primary bibliographic entry see Field 06B. W73-10564

DEVELOPMENT OF DESIGN STORM HYETO-GRAPHS FOR CINCINNATI, OHIO, Cincinnati Univ., Ohio. Dept. of Civil and En-vironmental Engineering. For primary bibliographic entry see Field 02B. W73-10679

THE METROPOLIS RUNS DRY,
Massachusetts Univ., Boston. Dept. of Political
Science. For primary bibliographic entry see Field 06E. W73-10686

RAW WATER TRANSMISSION SYSTEM FOR SPRINGFIELD, MASS., Hazen and Sawyer, New York. For primary bibliographic entry see Field 08A. W73-10687

SOCIAL AND ECONOMIC IMPLICATIONS OF PROPOSALS FOR OUT-OF-BASIN RIVER DIVERSIONS, Massachusetts Univ., Amherst. Water Resources Research Center. For primary bibliographic entry see Field 06B. W73-10688

EVALUATION OF THE OHIO WATER SUPPLY PROGRAM: SUMMARY. Environmental Protection Agency, Chicago, Ill. Div. of Air and Water Programs.
For primary bibliographic entry see Field 05G. W73-10692

TOWN OF CAIRO WATER SUPPLY REPORT. Diachishn (A.) and Associates.

Available from the National Technical Informa-tion Service as PB-214 025, \$3.75 in paper copy, \$0.95 in microfiche. Prepared for Greene County Planning Department, Cairo, New York, August, 1972. Report No GCPD 3-lb. 30 p, 4 fig, 4 tab. HUD Grant N. Y. P. 246.

Descriptors: *Planning, *Water supply, Water demand, Land use, Water sources, *New York, *Water districts, *Comprehensive planning, *Ci-Identifiers: *Cairo (New York), Water supply

system improvements.

A general planning study for future water supply for the Town of Cairo in New York State is presented. This report and a companion wastewater collection and disposal study are integral parts of the town's comprehensive plan. It is felt that water supply and sewerage systems are very important not only for the growth of the town but also to control the location and density of urban land use. The report covers the expected population growth in the area, future water supply demands up to the year 2020, potential sources of water supply, i.e. groundwater and small impoundments, the existing water supply system, and a master plan for additions and improvements to this system. It is recommended that a water district be established and that it purchase the existing water supply system and implement the master plan. (Elfers-North Carolina)

FORMATION OF PUBLIC POLICY ON ISSUE OF OUT-OF-BASIN DIVERSION OF CONNEC-TICUT RIVER FLOOD WATERS TO BOSTON METROPOLITAN AREA, Massachusetts Univ., Amherst. Water Resources

Research Center.
For primary bibliographic entry see Field 06B.
W73-10726

HISTORICAL, POLITICAL AND SOCIAL FACTORS AFFECTING PUBLIC POLICY ON RIVER DIVERSION: OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO THE BOSTON METROPOLITAN

AREA,
Massachusetts Univ., Amherst.

Massachusetts Univ., Amnerst.
E. R. Kaynor.
In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area, Masachusetts Water Resources Research Center, Publication No. 25, 1973, Appendix A, 55 p. OWRR C-2169 (No. 3377) (1).

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3D-Conservation in Domestic and Municipal Use

Descriptors: *Diversion, *Attitudes, *Decision making, *Social impact, *Political aspects, *Connecticut River, *Massachusetts, Planning, Water necticut River, "Massachusetts, Planning, Water supply, Pumped storage, Flood flow, Environ-mental effects, Riparian rights, Multiple-purpose reservoir, Nuclear powerplants, Local govern-ment, Institutions, Inter-basin transfers. Identifiers: "Boston, Springfield (Mass.), Quabbin Reservoir, Northfield Mountain, Swift River, Chicopee River, Minimum flow, Public protest.

Response of Connecticut River valley citizens and officials to the proposed diversion of Connecticut River flood waters into Quabbin Reservoir is described. Opposition, while apparently broadly-based, was in fact attributable to a small constituency of activists. Opponents of diversion were more knowledgeable, better educated, younger, and more highly motivated than proponents. Opposition centered in the Springfield proponents. Opposition centered in the Springiteia area, but was not evident further downstream in the state of Connecticut. Opponents were generally mistrustful of government, and those declaring themselves neutral tended in fact to be opposed. While officials favored diversion more than citizens, elected officials were dispropor-tionately neutral. Political party affiliation had no bearing on this issue. Occupation was the most clearcut, apparent determinant of one's position. Reasons for opposition were most frequently re-lated to the precedent set for future diversions of lated to the precedent set for future diversions of larger scope, alleged harmful environmental consequences, and failure of the Metropolitan District Commission to seek other alternatives. Opposition to the diversion proposal was effective in delaying its official approval but not in changing the proposal itself in any significant particular. Effectiveness of opposition might have been greater had opponents taken a more low-toned, factual approach being normal metropic proposition of the proposition o proach giving more credence to the rational points made by the proposal's supporters. (See also W73-W73-10727

3E. Conservation in Industry

POTENTIALS FOR A DELAWARE DEEP-WATER PORT.
Gladstone Associates, Washington, D.C.

Prepared for the Delaware State Planning Office, Dover, October, 1970. 129 p, 23 fig, 38 tab, 44 ref, 4 append.

Descriptors: *Economic feasibility, *Marketing, Environmental effects, Shorelines, *Delaware, *Water uses.

Identifiers: *Deepwater port, *Delaware Bay, Shoreland development.

This analysis of market potentials for a deepwater port (to handle supertankers) in the lower Delaware Bay is predominantly economically oriented and thus does not cover factors such as oriented and time does not cover factors such as environmental impacts, design criteria, and state regulatory policy. The emphasis is on which indus-tries and/or economic goods would take advantage of the deepwater port. Petroleum and iron ore are seen to have a high potential use of the port facility while coal, each and forest records would have while coal, grain, and forest products would have low potentials. Some of the conclusions include: (i) probably only one deepwater port will be built on the East Coast in the 1970's; (2) the Delaware Bay is as advantageous a site as any on the East Coast; (3) on-shore development is not necessary Luss; (2) on-snore development is not necessary for the operation of the port but petroleum and iron ore related industries are likely to be attracted; (4) private sector savings from the use of such a port should be substantial; and (5) public sector costs and benefits must be calculated also to determine the desirability of the port and the specific location. (Elfers-North Carolina) W73-10690

3F. Conservation in Agriculture

ECONOMIC AND LEGAL ASPECTS INVOLVED IN THE EXCHANGE OF SEWAGE EFFLUENT FOR IRRIGATION WATER FOR MUNICIPAL USE, CASE STUDY-CITY OF TUCSON,
Arizona Water Resources Research Center, Tuc-

For primary bibliographic entry see Field 05D. W73-10402

INVESTIGATION OF NATURAL SEALING EF-FECTS IN IRRIGATION CANALS, Idaho Univ., Moscow. Dept. of Civil Engineeri For primary bibliographic entry see Field 04A. W73-10404

ANALYSIS OF WATER CONSUMPTION OF VARIOUS GRAPE CULTIVARS, Levi Eshkol School of Agriculture, Jerusalem

For primary bibliographic entry see Field 02D. W73-10440

CONSTRAINTS IN WATER MANAGEMENT ON AGRICULTURAL LANDS, Colorado State Univ., Fort Collins. Dept. of

G. E. Radosevich, E. C. Vlachos, and G. V.

Water Resources Bulletin, Vol 9, No 2, p 352-359, April 1973.

Descriptors: "Water management (Applied), "Irrigation, "Administration, "Social aspects, "Water law, "Water policy, Irrigation practices, Irrigation districts, Social values, Return flow, Water rights, Water quality control, Constraints.

Whether the goal is minimizing water quality degradation in receiving streams or maximizing agricultural production on existing croplands, the agricultural production on easting cropiands, the solutions are identical—improved water management practices. Technology has succeeded in developing feasible solutions to improvement of irrigation water management, but the law has been allow to direct or encourage implementation. The culprit of the western United States water problem culprit of the western United States water problem is the property right concept of the appropriation doctrine. The most substantial impact in solving the legal and other institutional constraints inherent in the appropriation doctrine would be more stringent application of the beneficial use concept. Moreover, water quality should be made a part of each water right, the appurtenancy concept, which ties water to land, should be eliminated, and water laws should be modified to encourage the renting, leasing, transferring or selling of water rights to other uses and places so long as the vested rights of others are protected. Improving water management also implies organizational improvements such as increasing project irrigation efficiency and effectiveness through gameatons improvements such as increasing pro-ject irrigation efficiency and effectiveness through consolidation of fragmented irrigation and drainage districts into valley-wide single manage-ment units. All attempts for modifying water use ust be guided by a pervasive spirit of social con-iousness. (Bell-Cornell) W73-10621

TWO-AND THREE-DIMENSIONAL INFILTRA-TWO-AND INFERENDIAL STORM INVESTIGATION: SEEPAGE FROM IRRIGATION CHANNELS AND INFILTROMETER RINGS, Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 04A. PORTABLE RESISTANCE TO WATER TRANS-PORT IN LEAF TISSUE OF KALE, Ceakoslovenska Akodemie Ved, Prague. Ustav Experimentalni Botaniky. J. Pospisilova.

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Biol Plant (Prague). Vol 14, No 4, p 293-296, 1972.

Identifiers: *Kale, Leaf tissue, *Water transport (Plants), Water potential.

The constant values of water potential gradient ac-companying various levels of water flow rate were found in kale leaf tissue segments. This constancy was an indicator of the decrease of resistance to water flow as flow rate increased.—Copyright 1973, Biological Abstracts, Inc. W73-10627

RICE GROWING IN DEEP WATER IN MALL,

Agron Trop Ser Riz Rizic Cult Vivrieres Trop. Vol 26, No 10, p 1100-1114, 1971. Illus. English sun

Identifiers: Drought, Fertilizers, Insect, *Mali, Pests, *Rice growing, Weeds.

High rice-fields where flooding does not exceed 1 m and low rice-fields where it ranges from 1 m to 3 m are distinguished. The rate of water rise can be higher than 10 cm/day at the beginning of flooding, it is about 3 cm/day towards the end of the rising it is about 3 cm/day towards the end of the rising period. Farmers sow in July after one or more plowings from March-April and rice is grown as rainfed rice till the flood occurs. The limiting factors of this rice-growing method are: drought, weeds, insect pests, inadequate fertilizers and late harvests.—Copyright 1973, Biological Abstracts, W73-10628

COMSUMPTION OF WATER AND FREQUENCY OF IRRIGATION IN RADISH (RAPHANUS SATIVUS L.), BY NEUTRON MODERATION METHOD IN SOIL MOISTURE DETERMINA-METHOD IN SUIL MOSS., TIONS, (IN PORTUGUESE), TIONS, (EN PORTUGUESE),

Instituto Agronomico, Campinas (Brazil).

J. B. I. Dematte, M. E. S. P. Dematte, and T. Igue.

Bragantia. Vol 30, No 1, p 21-25, 1971. Illus. En-

Braganta. Vol. 79 21-25, 1971. Indus. En-glish summary. Identifiers: Frequency, Irrigation, *Radish, Raphanus-Sativus, *Soil moisture, Water utiliza-tion, Neutron moderation method.

The highest average soil moisture 18 days after germination, with 5.6 mm, while the lowest was 20-23 days after germination, with 3.6 mm. The irrigation frequency was 4 days.—Copyright 1973, Biological Abstracts, Inc.
W73-10629

THE EFFECT OF POTASSIUM ON THE WATER REGIME OF THE COTTON PLANT, (IN AZERBAIJAMIAN),

12v Agad Nauk Az SSR Ser Biol Nauk. No 4, p 74-79, 1971. Illus. English summary. Identifiers: Cell sap, *Cotton plants, Osmotic pressure, *Potassium fertilizer, Pressure, Fertil-izers.

K fertilizers exerted a positive effect on water regime of the cotton plant with an increase in water-retaining capacity of leaves by 4.3-5.5% observed. K fertilizers significantly decreased the residual (0.81-1.83% moist weight) as well as the daily moisture deficit (by 1.75-3.97%) in different developmental phase: day mostarie dentit (by 1.73-3.79a) in directent developmental phases. K promoted the increase of cell sap concentration by 0.34-2.11% and, cor-respondingly, the osmotic pressure of cell sap by 0.92-2.63 atm in comparison with the control.— Copyright 1973, Biological Abstracts, Inc.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Agriculture—Group 3F

AGROMETEOROLOGICAL INDICATORS OF THE MAIZE DEVELOPMENT IN THE REPRODUCTION PERIOD, (IN BULGARIAN), Maize Research Inst., Knezha (Bulgaria).

N. Slavov. Rasteniev''d Nauki. Vol 9, No 1, p 3-11, 1972. Il-Has. English summary.

Identifiers: Equations,
(Agrometeorological), "Maize, Soil moisture".

*Reproduction, Air temperature, *Air moisture. Indicators Soil moisture,

A direct relationship exists between the length of the tasseling-silking initiation and air temperature and an inverse relationship between this period and soil moisture. An inverse relationship was ob and soil moisture. An inverse relationship was observed between the length of the silking initiation-milking subperiod and air temperature. The length of the milking-dough maturity subperiod was closely related to the effective temperature. The length of the dough-full ripeness subperiod depends on the mean daily deficits of air moisture. Equations are presented for these relationships.—Copyright 1973, Biological Abstracts, Inc. W73-10635

ON THE WATER CONSUMPTION OF WHEAT GROWN IN THE REGION OF PAZARDJIK IR-RIGATION SYSTEM, (IN BULGARIAN), Institute of Water Engineering and Land Improve-ment, Sofia (Bulgaria).

Rastenievd Nauki, Vol 9, No 3, p 47-63, 1972. Il-

Rasteners : hus. English summary.

Identifiers: *Bulgaria (Pazardjik), Fertilizers,
Growth, Irrigation, *Wheat, Yield, Water require-

The water consumption of 'San Pastore' winter wheat grown on Bulgarian cinnamonic forest soils was determined. The field experimentation consisted of the following variants: no irrigation; pre-, or post-seeding irrigation; pre-, or post-seeding and irrigation to maintain the soil moisture during the sowing-jointing, jointing-milk stage and milk stage-harvest subperiods at 70% of the field the sowing-jointing, jointing-milk stage and milk stage-harvest subperiods at 70% of the field moisture capacity (fmc) respectively; pre-, or post-seeding and irrigations for maintaining soil moisture of 70-80-70% of fmc during the respective subperiods, given in the third variant, and irrigation merely during the cropgrowing season for maintenance of the same soil moisture in the example subperiods as in the fourth variant. The respective subperiods as in the fourth variant. The water requirements of wheat at maintenance of soil moisture of 70-80-70% of fmc varied between soil moisture of 70-80-70% of fmc varied between 4100 and 5660 cu m/ha for the 8-yr period 1962-1969. The water consumption for the jointing-heading and heading-milk stage subperiods accounted for 24 and 21.5% respectively of the consumptive use of water for the entire growing season. The daily use-rate varied widely by variety water and period. It is the highest during season. The daily use-rate varied widely by variants, years and periods. It is the highest during heading and milk stages reaching a peak of \$2.3 cu m/ha. The maximum daily use-rate of irrigated wheat occurs 10 to 15 days later compared to unirigated wheat. There is a close correlation between the water use for 100 kg grain produced and yield. The water consumption at different levels of fertilizing is not in a linear dependence on yield. At fertilizer levels over N100P80K60, water consumption decreases and yield increases. Conv. sumption decreases and yield increases.—Copy-right 1973, Biological Abstracts, Inc. W73-10636

THE EFFECT OF PLOWING UNDER CORN STRAW ON SOME SOIL PROPERTIES AND THE YIELD OF CORN UNDER CONDITIONS OF DRY FARMING AND IRRIGATION, (IN

OF DRY FARMING AND IRRIGATION, (IN SERBO-CROATRAN), (CON Inst., Belgrade (Yugoslavia).
R. Jovanovic, P. Maksimovic, and I. Franic. Arh Poljopr Nauke. Vol 25, No 89, p 39-48, 1972. Illus. English summary. Identifiers: Air, Compaction, *Corn, *Dry farming, Irrigation, *Plowing, Soils, Straw (Corn), Yield.

Two factorial trials were set up according to the split-plot scheme in the following combinations:

(a) corn straw removed, (b) corn straw plowed under. The 4 line hybrid 'Zemun Polje 755' was used. Plowing was done in Oct. to a depth of 30 cm. Soil samples were taken directly after the autumn plowing, in the spring during the first 10 days of April and after harvesting the corn during the second half of Oct. After 3 yr the soil in which corn straw was plowed under had a compactness of 0.060 g/cm3 during the first, 0.087 g/cm3 during the second, and 0.060 g/cm3 during the third measurement. The soil from which the corn straw had been removed between the first and second measurement and second measurement. been removed between the first and second measurement had a 0.13 g/cm3 increase in compactness. With irrigation the difference in soil compactness in 1966-1967 was 0.06 g/cm3 between the first and second measurement and 0.18 g/cm³ between the first and third measurement. In 1968 the difference in soil compactness was 0.08 g/cm³ between the first and second and 0.19 g/cm³ between the first and third measurement. With dry farming, the combination in which the corn straw was plowed under had a 0.453 volume% air capacity increase during the first, a 0.470 volume% increase during the second and 0.364 volume% increase during the third measurement. Under con ditions of irrigation and due to plowing under the corn straw, a higher yield of corn was obtained. Under conditions of dry farming and due to the effect of plowing under the corn straw, a higher yield of kernel was also obtained.—Copyright 1973, Biological Abstracts, Inc. W73-10637

WATER INFILTRATION UNDER CENTER-

-PIVOTS, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. J. W. Addink.

Ph. D. Dissertation, August 1972. 145 p, 36 fig, 18 tab, 53 ref. OWRR-B-039-COLO (6).

Descriptors: *Sprinkler irrigation, *Irrigation systems, *Agricultural runoff, *Rate of application, Water conservation, *Soil moisture, tion, Water conservation, *Soil moisture, Pipelines, Laboratory tests, Numerical analysis, Model studies, Equations, Darcy's law, Continuity equation, *Infiltration rates, Hysteresis, Flow, Shrinkage. Identifiers: *Center-pivots

Because of their labor-saving advantage and abili-ty to irrigate rolling terrain and light soils, centerty to irrigate rolling terrain and light soils, center-pivot sprinkler systems are popular. Consisting of water pipelines suspended in the air by cables or trusses and self-propelled towers, the system slowly revolves in a circle while distributing the water by sprinklers connected above the pipelines. The literature is examined at length, then the experimental design and procedures employed in the laboratory are described. Equipment included soil separation compartments, soil drying equipment, spray bar, runoff collection containers, and tensolution confected to manometers to monitor soil moisture tension. The numerical simulation model provided a solution to moisture flow equations derived from Darcy's Law and continutiy, and was extended to predict conditionsbeyond those of the laboratory infiltration tests. Further extensions to calculate possible effects of shrink-ing and swelling are also suggested. Main conclu-sions drawn are that a numerical moisture-flow model can be a helpful research tool, and that nonsymmetrical application rate patterns have potential for reducing runoff 10 percent or more under center-pivot sprinkler systems. (Popkin-Arizona)

A SUBJECTING AND LINEAR PROGRAMMING ANALYSIS OF IRRIGATION WATER VALUES IN NORTHERN WYOMING, Wyoming Univ., Laramie. Dept. of Agricultural Economics. A BUDGETING AND LINEAR PROGRAMMING

T. L. Dobbs, and J. R. Owen.

Wyoming Water Resources Research Institute, Completion report, November 1972. 88 p, 9 fig, 22 tab, 40 ref. OWRR-A-001-WYO (59).

Descriptors: *Linear programming, *Irrigation water, Water balance, *Budgeting, *Wyoming, Water management (Applied), Agriculture, *Water utilization, Alfalfa, Grasses, Hay, Pastures, Model studies, Value, Water rights, Limiting factors, Hydrologic data, Water demand, Water conservation.

Wyoming became formally involved in water planning with the State Water Plan of 1967. This Wyoming became formally involved in water planning with the State Water Plan of 1967. This study provides information relating to agricultural water uses which should aid in the water planning. Irrigation water values for major drainages are estimated, and current patterns of agricultural water use are described for the study area in Wyoming. Budgeting analysis is used to estimate irrigation water which increased flood-irrigated alfalfa, grass hay and pasture. Linear programming analyses generated three solutions for two ranch models in each basin of the study area. The annual values of assumed water rights are claculated by the analysis. Estimated annual values of assumed water rights are claculated by the analysis. Estimated annual values of assumed water rights ranged from \$7.76 down to \$2.93 per acre foot for the two model ranches. Irrigation water was generally found to be most limiting in July. More reliance can be placed in the so-called crops-only model than in the crops-and-livestock model, because of the greater emphasis placed on collection of crop data. Regional research for Wyoming water planning relating to irrigation and industrial water demands is suggested. The assumptions of linear programming analysis are reviewed. (Popkin-Arizona)

AN ECONOMIC ANALYSIS OF CENTER--PIVOT SPRINKLER IRRIGATION SYSTEMS IN SOUTHEASTERN WYOMING, WIT EMPHASIS ON FINANCING ALTERNATIVES, WITH Wyoming Univ., Laramie. Dept. of Agriculta

Economics.
T. L. Dobbs, and W. G. Wedemeyer.
Wyoming Water Resources Research Institute,
Completion report, Oct. 1972. 42 p, 1 fig., 19 tab, 22
ref. OWRR-A-002-WYO (2).

Descriptors: *Economic impact, *Sprinkler irriga-tion, *Wyoming, *Financing, *Irrigated land, Loans, Interest rates, *Economic feasibility, Costs, Return flow, Data collections, Investment, Crop production, Potatoes, Sugar beets, Profit, Land use, Alfalfa, Corn (Field), Rotations, Risks, Sampling, Forages. Identifiers: *Center-pivots, Cash crops.

Identifiers: *Center-pivots, Cash crops.

Wyoming has experienced a rapid expansion in acreage irrigated by center-pivot sprinkler systems as a result of state supported low-interest loans. This study determines alternative sources of financing and assesses the economic feasibility of center-pivot sprinkler systems. Cost and return flows were estimated, and financial and economic data were analyzed. More than one-half of the center-pivots in use by 1971 were financed by a low-interest state loan plan. Investments in sprinkler systems for production of cash crops (potatoes, sugarbeets) can be highly profitable, and do not depend on low-interest financing conditions of low-interest financing and relatively low-value alternative uses for land do investments in sprinklers strictly for affalfa production become economically attractive. Profitability of sprinkler investments in corn-alfalfa rotations is influenced co-siderably by corn silage values and by financing utilized. Investments in sprinklers for production of forage crops are economically feasible only under particular sets of assumptions. Uncertainty issues of sampling size bias are noted. (Popkin-Arizona)

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation in Agriculture

THE EFFECT OF ROOT GEOMETRY ON THE YIELD OF WHEAT GROWING ON STORED

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research and Regional Survey.

Australian Journal of Agricultural Research, Vol 23, No 5, p 745-752, Sept 1972. 5 fig, 9 ref.

Descriptors: "Root development, "Crop production, "Wheat, "Soil water, "Plant growth regulators, Crop response, Soil-water-plant relationships, Droughts, Hydraulic properties, Root systems, Grains (Crops), Harvesting, Cultivation, Wainth Water supply."

Weight, Water supply.

It is common for wheat crops to rely heavily on stored water in drought-prone environments. Pot experiments are described which test the thesis that increasing the hydraulic resistance of the root system will increase grain yield of wheat growing entirely on stored water. One experiment measured only water use and final grain yield. The main experiment included the observation of the performance of the plant through time. Pots were weighed every week, and periodic harvests were made after sowing. Root weights were also estimated. Restricting the root system to one seminal root decreased the rate of water use during the first few weeks of growth. The larger mount of water available during the last few weeks of growth. When Gabo wheat is growing on limited stored water, the grain yield can be greatly increased by forcing the plants to rely solely on one seminal root. The single-root plants use less water before anthesis than do normal plants because they have a much larger resistance to vertical flow through the root system. The xylem of the seminal root is dominated by one large vessel whose diameter probably determines the hydraulic resistance. It is possible to breed high root resistance into existing cultivars by breeding for smaller vessels. (Popkin-Arizona)

ADDITIONAL WATER-RETAINING FORCES OF HARDENED TILLERING NODES OF WINTER WHEAT DURING THEIR DRYING

WINTER WHEAT DURING THEIR DRYING AND FREEZING, (IR RUSSIAN), Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology. G. A. Samygin, and A. Z. Livahin. Dakl Akad Nauk SSSR Ser Biol. Vol 203, No 4, p

961-964. 1972.

Identifiers: Drying, Freezing, *Tillering nodes, *Wheat, Water retention (Plants).

During drying and freezing, large additional water-retaining forces (about 80 atm) developed only in whole winter-wheat tillering nodes with a length of the sheath part at least 1.5 cm. In further studies of the nature and conditions of occurrence of addi-tional water-retaining forces it will be necessary to work with whole tillering nodes of approximately this size.—Copyright 1973, Biological Abstracts, Inc. W73-10704

WATER REGIME OF SOD-BROWN SOILS AND RELATION OF TEA-LEAF YIELD PRECIPITATION (VODNYY REDERNOVO-BUROZEMNYKH POCHY REZHIM POCHV I CHAYNOGO ZAVISIMOST' UROZHAYA CHAYNC LISTA OT OSADKOV), For primary bibliographic entry see Field 02G. W73-10776

SURVIVAL OF MAIZE BACTERIAL STALK ROT PATHOGENS IN INFECTED TISSUE UNDER DIFFERENT MOISTURE AND TEM-PERATURE CONDITIONS, Udaipur Univ. (India). Agricultural Experiment Station.

T. B. Anilkumar, and B. P. Chakravarti.

Indian Phytopathol. Vol 24, No 3, p 567-570. 1971. Identifiers: *Bacterial stalk rot, Erwinia carotovora, *Maize, Moisture, *Pathogens, Pseu nas-Lapsa, Temperature

Erwinia carotovora survived for 24, 15 and 12 wk at 10C, 20C and 30C, whereas Pseudomonas lapsa survived for 30, 18 and 18 wk respectively, under similar conditions. E. carotovora survived for 18 wk at 98% humidity (RH), 15 wk at 95% RH and 12 kk at 90% and 81% RH, while P lapsa survived for 24, 18, 15 and 18 wk respectively at these relative humidities. In infected maize stalk collected from the field, E. carotovora survived 27-36 wk and P lapsa survived 40-43 wk depending on the nature of the plant itsue infected. Survival was higher in the root portion than in the aboveground portion.—Copyright 1973, Biological Abstracts, Inc. W73-10800

DESERT PRODUCTIVITY AND ITS DYNAMICS IN CONNECTION WITH METEOROLOGY, (IN RUSSIAN),

For primary bibliographic entry see Field 02I. W73-10808

EFFECT OF CHEMICAL FERTILIZERS ON MAIN MORPHOLOGICAL AND PHYSIOLOGI-CAL FEATURES IN IRRIGATED WHEAT, (IN RUSSIAN), Institutul de Cercetari Pentru Cereale si Plante

Tehnice, Fundulea (Rumania). L. Pirjol, I. Picu, and C. I. Mili An Inst Cercet Pentru Cereal

An Inst Cercet Pentru Cercale Plante Teh Fundu-lea Ser C Amelior Genet Fiziol Tehnol Agric. 37: p 9-26. 1969 (1971). Illus. English summary. Identifiers: "Fertilizers (Chemical), Irrigation, Morphological studies, Physiological studies, "Wheat, Yields.

'Bezostaia 1' was studied under irrigation conditions on 3 soils fertilized with P (PO, P40, P80) to which 5 increasing N rates (NO, N40, N80, N120, N160) were applied at winter plowing. Studies were then carried out using 'F 38/64,' 'F 49/64,' 'F 7/64,' 'F 246/65' and 'F 360/64' lines, and 'Bezostaia 1' and 'Capitole' planted on 3 previously differently fertilized soils (N100P50, N150P50 and N200P50). In 'Bezostaia 1' the N160P40, N80P80, N120P80 and N160P80 treatments as well as in 'F 360/64, 'F 49/64,' 'F 246/65' fertilized with N200P50 and N150P50, proved remarkable in growth and development rate, a smaller necroais percentage and a high metabolic activity during the whole plant vegetation period which led to a higher accumulation of nutrients and outstanding yields.—Copyright 1973, Biological Abstracts, Inc.

OVERHEAD IRRIGATION OF SUGAR BEET ON SILTY LOAM: THE EFFECT OF SPRIN-KLING AND N-MANURING ON YIELDS AND ESSENTIAL QUALITY FACTORS, (IN GER-MAN),

Stutteart-Hohenheim (West-Hohenheim Univ., Stutteart-Hohenheim (West-

eim Univ., Stuttgart-Hohenheim (West

Ronenneim Ciniv., Stategar-Honeaneim (west Germany). K. H. Martin, and A. Kachani. Z Acker Pflanzenbau. Vol 134, No 1, p 1-24. 1971. Illus. English summary. Identifiers: Ash, Growth, Irrigation, Leaf, *Loam soils, Manure, Nitrogen, Roots, Silty loam, Sprinkling, *Sugar beets, Yields.

The yield of sugar beet roots with overhead irrigation at 75% of available capacity, showed only a small increase in a wet year, whereas in a year when there were a number of dry periods, increases in yield were obtained up to a maximum of 13.3%. Increased N-manuring only resulted in an increase in only 1 yr. Leaf growth showed an increase both with overhead irrigation and increased N-manuring. Sugar content showed almost no response to irrigation in the wet year but in the dry year there was an increasingly marked fall after

each successive irrigation. The fall in the final sugar content at harvesting was relatively small in those cases where no irrigation was given during the last 4 wk. In all cases, increased N-manuring resulted in a decrease in sugar content. The soluble ash content was higher after every irrigation. This tendency to a higher soluble ash content was further strengthened by supplementary N-manuring. Harmful N content in 1968 was reduced in all cases, but in the dry year this reduction was only obtained under intensive irrigation, while increased N-manuring had a reverse effect. The 'corrected' sugar yield showed an improvement in both years as a result of irrigation. Compared with the non-irrigated control, however, the difference was not statistically significant.—Copyright 1973, Biological Abstracts, Inc.

BACTERIAL BLIGHT OF CARROT IN

BACTERIAL BLIGHT OF CARROT IN WISCONSIN, Wisconsin Univ., Madison.
S. M. Saad, and E. K. Wade.
Plant Dis Rep. Vol 36, No 9, p 744-746. 1972. Illus. Identifiers: Bacterial studies, *Blight, *Carrot, Daveus-Carota, Electron microscopy, Humidity, Relative humidity, Tests, *Wisconsin, Xanthomonas-Carotae.

Bacterial blight of carrot caused by Xanthomonas carotae was found for the first time in Wisconsin during the summer of 1971. The disease was observed on the leaves, stems, and petioles of carrots (Daucus carota), cv. 'Spartan Sweet,' grown on a muck farm in Jefferson County. The Nantes cultivar showed only a trace of infection. A high level of relative humidity (RH) of 90-100% for 48-72 hr after inoculation is necessary for the bacteria to cause infection. Typical disease symptoms appeared on the foliage within 12-15 days with severe infection developing at the end of 20 days. Electron microscope study, the Hugh-Leifson test, and other tests indicated that the bacterium was Xanthomonas.—Copyright 1973, Biological Abstracts, Inc. stracts, Inc W73-10812

EFFECT OF CLIMATIC FACTORS ON ALPHA, EFFECT OF CLIMATIC FACTORS ON ALPHA,
BETA, GAMMA CAROTENE AND
XANTHOPHYLL CONTENT IN CORN DOUBLE
HYBRIDS, (IN RUMANIAN),
Institutal de Cercetari Pentru Cereale si Plante
Tehnice, Fundulea (Rumania).

An Inst Cercet Pentru Cereale Plante Teh Fundulea Ser C Amelior Genet Fiziol Tehnol Agric. 37 p. 147-154. 1969 (1971). English summary. Identifiers: "Carotene, Climatic factors, "Corn hybrids (Double), Light, Temperature, "X-othershifts."

hundred and fifty samples of corn kernels analyzed in 3 corn double hybrids (HD 98, were analyzed in 3 corn double hybrids (HD 98, HD 99 and HD 120) with a shorter growth time, grown at 9 experiment stations and in 3 hybrids (HD 261, HD 310 and HD 311) with a longer growth time. Carotenoid accumulation is to a great extent conditioned by temperature and moisture in June-July-Aug., as well as by light in June. An 18-20C temperature and balanced rainfall favors carotenoid accumulation. A temperature of over 21C and reduced rainfall hinder carotenoid accumulation. Carotenoid synthesis is promoted by intensive light in June. Xanthophyll content is stimulated by abundant rainfall in Aug.—Copyright 1973, Biological Abstracts, Inc. W73-10856

RESISTANCE TO DROUGHT OF SOME CORN SINGLE HYBRIDS DEVELOPED AT THE ICCPT-FUNDULEA AND OF THEIR COM-PONENT LINES, (IN RUMANIAN), Institutul de Cercetari Pentru Cereale si Plante Tehnice, Fundulea (Rumania).

T. Muresan, C. I. Milica, and A. M. Juncu

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Control of Water on the Surface—Group 4A

An Inst Cercet Pentru Cercale Plante Teh Fundu-lea Ser C Amelior Genet Fiziol Tehnol Agric. 37 p, 115-133, 1969-1971. Illus. English summary. Identifiers: "Corn hybrids, "Drought resistance (Plants), Growth, Heterosis, "Romania.

Under conditions of optimal soil moisture the investigated single hybrids present varied heterosis effects, manifested by growth rate and accumulation, in stalk leaves, ears and roots. Differences between the lines were particularly marked in potential of drought resistance.—Copyright 1973, Biological Abstracts, Inc. W73-10864

IRRIGABILITY CLASSIFICATION OF SOILS, (IRRIGABLE SOILS OF NEVADA).

Nevada Division of Water Resources Map S-15, 1973. 1 map, 3 tab, 2 ref.

Descriptors: "Irrigable land, "Agriculture, "Soil classification, "Nevada, Soil properties, Crops, Soil mechanics, Irrigation, Land management, Temperature, "Maps, Soil-water-plant relationships, Evaluation.

ships, Evaluation.

This classification which includes tables and a multicolor map, is a rating system which indicates the potential usefulness of different kinds of soil for irrigated agriculture in Nevada. It is based on both judgements of the feasibility of initial improvements such as drainage, removing stones, leveling, ripping hardpan, or removing soluble salts and alkali, and on continuing limitations for use requiring special management, such as control of salt buildup. It does not consider the present availability or lack of irrigation water. The classification is intended for general planning, rather than for location of specific fields for agriculture or for identification of specific fields for agriculture or for identification of pocific management needs. But, it does indicate major limitations for initial improvement and major hazards to continued use. Five major classes of potential use limitations. Since length of growing season is so important in determining the kinds of crops which might be grown and their economic value, the irrigability classes are subdivided again according to the recze-free (32 deg f?) season zone in which the various soils occur. (Woodard-USGS)

DRAINAGE COEFFICIENT FOR SURFACE DRAINAGE OF AGRICULTURAL LAND FOR DIFFERENT PARTS OF THE COUNTRY, Soil Conservation Research, Demonstration and Training Center, Dehra Dunn (India). S. K. Gupta, K. G. Tejwani, and R. Babu. Irrigation and Power (India), Vol 28, No 1, p 53-60, January 1971. 8 fig, 1 tab, 6 ref.

Descriptors: *Drainage systems, *Irrigation, *Agricultural engineering, Design criteria, Methodology, Crops, Soil types, Rainfall intensi-ty, Land use, Forecasting, Correlation analysis, Furrow drainage, Contour farming, Terracing, Land management, Foreign countries.

Surface drainage has great scope in India, especially in black soils and irrigated areas. Regional standards for design of the drainage systems need to be prepared for the use of field staff. For surface drainage, the main requirement is a suitable outlet. The outlet design is dependent on the 'drainage coefficient' which denotes the depth of water to be removed per day. The method of estimation involves consideration of the crops to be grown, soil cover complex numbers, rainfall intensity, and conversion of this rainfall to the runoff depth. Surface drainage from agricultural lands can be broadly grouped into three categories according to the sensitivity of crops to waterlogging, e.g., vegetables, grains, and rice require

that excessive water may be drained within 6, 24, and 72 hours respectivity, so that no damage is caused to the crops by waterlogging. (Woodard-USGS)

04..WATER QUANTITY MANAGEMENT AND CONTROL.

4A. Control of Water on the Surface

INVESTIGATION OF NATURAL SEALING EF-FECTS IN IRRIGATION CANALS, Idaho Univ., Moscow. Dept. of Civil Engineering.

Idaho Univ., Moscow. Dept. of Civil Engineering. C. E. Brockway. Available from the National Technical Informa-tion Service as PB-221 010, \$3.75 in paper copy, 80.95 in microfiche. Idaho Water Resources Research Institute Completion Report, May 1973. 35 p. 10 tig., 1 tab, 65 ref. OWRR A-023-IDA (1). 14-01-001-3212.

Descriptors: *Canal seepage, Tensionmeters. *Idaho, *Seepage, Seepage control, *Hydraulic conductivity, Clays, *Irrigation canals, Loam, Soil moisture, Irrigation water, Microbial degradation. Identifiers: Clay swelling.

Results of a three year study on the factors contributing to natural sealing of irrigation canals and reservoirs are presented. Laboratory evaluations of the effect of sedimentation, microbiological activity and soil-water chemical reactions on the hydraulic conductivity of soils were performed. Particular emphasis was on the Portneut silt-loam soil of southern Idaho. Techniques for determining and predicting the sediment entrapment in soils from hydraulic conductivity measurements in laboratory columns are presented. Application of a laboratory columns are presented. Application of a method utilizing soil clay content, exchangeable sodium percentage, and total salt concentration of irrigation water to predict hydraulic conductivity is evaluated. The effect of microbiological activity in the benthic area of canals and reservoirs on scepage rates is discussed. Field tests in an operating canal to monitor soil moisture tension moisture and seepage rates during an irrigation season are outlined. Long term reduction in seepage rates of canals constructed in silt-loam soils is due to the formation of an impeding layer on the canal bottom due primarily to sedin tion. Seasonal changes are predominantly affected by microbiological activity in the impeding layer. W73-10404

LOCAL ECONOMIC IMPACT OF RESERVOIR

RECREATION, Tennessee Univ., Knoxville. Dept. of Economics. For primary bibliographic entry see Field 06B. W73-10415

METHODOLOGICAL IMPROVEMENTS IN MEASURING ECONOMIC EFFECTS OF MULTIPURPOSE WATER RESOURCE PROJECTS. Berger (Louis), Inc., East Orange, N.J. For primary bibliographic entry see Field 06B. W73-10417

GEOHYDROLOGIC RECONNAISSANCE AND STUDY PLAN FOR WATER RESOURCES INVESTIGATIONS IN THE BARODA-BROACH AREA, GUJARAT, INDIA, Geological Survey, Washington, D.C. P. R. Seaber.

gical Survey open-file report, June 1972. 65

Descriptors: "Water resources, "Hydrology, "Surface waters, "Groundwater, "Water quality, Foreign countries, Geology, Climate, Soil types, Water utilization, Irrigation, Cotton, Water supply, Streamflow, Ponds, Water wells, Groundwater recharge, Chemical analysis, Well data, Water levels, Aquifers, Rainfall, Artificial recharge, Saline water intrusion. Identifiers: "India, Baroda-Broach area (India), Gujarat (India).

Gujarat (India).

The water resources of the Baroda-Broach area, Gujarat, India, are not fully utilized at present (1972). The surface-water resources of the Narmada River basin are largely unused, but could be utilized if the proposed dam near Rajpipla is 38.2 billion cubic meters, and the proposed dam has a contemplated storage of 17.3 billion cubic meters. The Tapti River is tapped for 10,000 cubic meters of water per day for use in water flooding of oil-bearing formations. The present system of domestic supply from village ponds utilizes surface storage of monsoon runoff directly and indirectly in the dry season (April-June) by artificial recharge and withdrawal through dug wells. The Baroda-Broach area is underlain almost everywhere by black cotton soil derived from weathering of the Deccan trap. Cotton is the main crop. Groundwater withdrawal mainly occurs from village wells and some irrigation wells, 10 to 90 meters deep. The Gujarat Alluvium of Holocene age contains the principal groundwater system. The groundwater is fresher toward the island hilly periphery and more saline toward the coast. The dissolved solids content of water in the Gujarat Alluvium ranges from approximately 127 to 15,600 mg/liter. (Woodard-USGS)

STOCHASTIC MODELS APPLIED TO OPERA-TION OF RESERVOIRS IN THE UPPER COLORADO RIVER BASIN IN TEXAS, Texas A and M Univ., College Station. Water Resources Inst.

For primary bibliographic entry see Field 02A. W73-10565

A PREDICTIVE MODEL FOR UPPER RIO-GRANDE INDEX FLOWS, Colorado Div. of Water Resources, Denver. A. R. Qazi, and J. A. Danielson. Water Resources Bulletin, Vol 9, No 2, p 284-290, April 1973. 7 fig. 17 equ, 6 ref.

Descriptors: *Regression analysis, *Water delivery, *Rio Grande River, *Colorado, *New Mexico, Equations, Estimating, Scheduling, *Texas, Streamflow, Precipitation (Atmospheric), Snow, Mathematical models, Systems analysis, State jurisdiction, *Forecasting, Water distribution (Applied), Interstate commissions.

Identifiers: Annual index flows, Historic data, Conejos River, Los Pinos River, San Antonio

There has been considerable controversy over the distribution of the Rio Grande River water among the Upper basin states of Colorado, New Mexico, and Texas. These states formed a joint commission in 1923 to study the problem. In 1939 a compact was ratified which provided for information exchange among these states and the establishment of gaging stations on and maintenance of the existing water supply levels of the Rio Grande. By 1968, Colorado had accrued a large debit, and so the Rio Grande Compact (1970) requires the state to deliver water to New Mexico at the State line on a yearly basis. The annual index flow for the Rio Grande and Conejos Rivers must be determined at the start of each calendar year, so that delivery schedules can be determined, in adnance, that meet the compact requirements. A model developed to aid in the prediction of these index

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flows is presented. Multiple regression analysis is applied using 24 years of streamflow, precipitation, and snow water contents records. Using this historic data and the IBM 360 system, equations are developed to predict the volumetric flows for mstoric cata and the IBM 360 system, equations are developed to predict the volumetric flows for the Rio Grande, Conejos, and Los Pinos Rivers at index stations. Results of the analysis are presented in the form of one equation for each month. (Bell-Cornell) W73.10502.

TWO-AND THREE-DIMENSIONAL INFILTRA-TION: SEEPAGE FROM IRRIGATION CHAN-NELS AND INFILTROMETER RINGS, Agricultural Research Council, Cambridge (En-gland). Unit of Soil Physics.

giana). E. G. You

E. G. Youngs. J Hydrol (Amst). Vol 15, No 4, p 301-315, 1972. Il-

filtrometer rings, *Irrigation channels, Laboratory tests, Pressure, Sand, *Seepage, Hydraulic conductivity. Identifiers: Channels, Hydraulic, *Infiltration, In-

The steady seepage rates at large times from flat-bottomed channels and channels of semicircular cross-section were determined in laboratory tank experiments using various sands. Good agreement was found with the theoretical relationships which was round with the theoretical relationships which assume the flow to be confined to a saturated region bounded by a capillary-fringe surface and to be uniform and vertical at great depths. The steady large-time seepage rates were also obtained in laboratory sand-tank experiments for the 3-dimensional cases, of seepage from circular shallow. laboratory sand-tank experiments for the 3-dimensional cases of seepage from circular shallow ponds and hemispherical sources. These agree with relationships obtained using an electrolytic tank analogue with approximate boundary conditions assumed for the flow region. A method of analysis of large-time seepage measurements from irrigation channels and infiltrometer rings is proposed, which yields the hydraulic conductivity and pressure head at the wetting front from experiments with different size channels or rings.—Copyright 1973, Biological Abstracts, Inc. W73-10626

GUIDELINES FOR HYDRAULIC CONSIDERA-TIONS IN HIGHWAY PLANNING AND LOCA-

American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design. For primary bibliographic entry see Field 08B. W73-10657

GUIDELINES FOR HYDROLOGY.

American Association of State Highway Officials,
Washington, D.C. Operating Subcommittee on
Roadway Design,
For primary bibliographic entry see Field 08B.
W73-10659 For primar W73-10658

HYDROLOGICAL STUDIES OF THE UPPER PARAGUAY RIVER BASIN (PANTANAL RE-GION, MATO GROSSO STATE, BRAZIL), United Nations Educational, Scientific and Cul-tural Organization, New York. Div. of Natural Resources Research. For primary bibliographic entry see Field 02E. W73-10682

THE METROPOLIS RUNS DRY, Massachusetts Univ., Boston. Dept. of Political For primary bibliographic entry see Field 06E. W73-10686

RAW WATER TRANSMISSION SYSTEM FOR SPEINGFIELD, MASS., Hazen and Sawyer, New York. For primary bibliographic entry see Field 08A.

W73-10687

SOCIAL AND ECONOMIC IMPLICATIONS OF PROPOSALS FOR OUT-OF-BASIN RIVER

Massachusetts Univ., Amherst. Water Resources Research Center. For primary bibliographic entry see Field 06B. W73-10688

POTENTIALS FOR A DELAWARE DEEP-WATER PORT.
Gladstone Associates, Washington, D.C.
For primary bibliographic entry see Field 03E.
W73-10690

MODEL FLOOD PLAIN ZONING ORDINANCE, Mid-Ohio Regional Planning Com

For primar W73-10691 ary bibliographic entry see Field 06F.

AN ANNOTATED OUTLINE OF A WATER-RESOURCES DEVELOPMENT PLAN FOR ALABAMA, Geological Survey of Alabama, University. For primary bibliographic entry see Field 06B. W73-10694

INFLUENCE OF SURFACE AND NEAR-SU-RFACE CALICHE DISTRIBUTION ON INFIL-TRATION CHARACTERISTICS AND FLOOD-ING, LAS VEGAS AREA, NEVADA, Nevada Univ., Reno. Center for Water Resources Research.

For primary bibliographic entry see Field 02E. W73-10721

FORMATION OF PUBLIC POLICY ON ISSUE OF OUT-OF-BASIN DIVERSION OF CONNEC-TICUT RIVER FLOOD WATERS TO BOSTON METROPOLITAN AREA, Massachusetts Univ., Amherst. Water Resources Research Center.

Research Center.
For primary bibliographic entry see Field 06B.
W73-10726

SALINITY PROBLEMS OF IMPOUNDMENTS AND THEIR MANAGEMENT, Agricultural Research Service Chickasha, Okla. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05G. W73-10734

PHREATUPHYTES ALONG THE BRAZOS RIVER AND SELECTED TRIBUTA-RIES ABOVE POSSUM KINGDOM LAKE, Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management. For primary bibliographic entry see Field 03B. W73-10745 WOODY PHREATOPHYTES ALONG THE

AN EVALUATION OF CURRENT PRACTICES

IN SEEPAGE CONTROL, Arizona Water Resources Research Center, Tuc-

son.
D. G. Boyer, and C. B. Cluff.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 125-152, (1972). 3 tab, 5 fig, 15 ref. OWRR A-035-ARIZ (1).

Descriptors: *Seepage control, *Ponds, *Lakes, *Surface water, *Costs, Physiochemical properties, Infiltration rates, Plasticity, Soil amendments, Arizona, Plastics.

Identifiers: Hydrophobic chemicals, Monovalent

Increased seepage control from natural and artificial waters are apparently necessary with increased frequency of construction and use of small ponds and lakes. Seepage control methods are becoming more numerous and diverse. Comparisons of effectiveness, longevity, and costs are not readily available. Control techniques used in Arizona are evaluated in terms of the above comparisons. Emphasis is placed on physiochemical methods, such as plastic, soil compaction aids, hydrophobic chemicals and monovalent cation applications. Results of field comparison tests using double-ring infiltrometers are presented. Limitation of the control products are discussed. Additional research should be undertaken to improve the technology of seepage control. (See also W73-10818) (Popkin-Arizona)

INPUT SPECIFICATIONS TO A STOCHASTIC DECISION MODEL, Arizona Univ., Tucson. Dept. of Systems and In-

dustrial Engineering.
D. M. Clainos, L. Duckstein, and T. G. Roefs.

In: Hydrology and Water Resources in Ariz and the Southwest, Vol 2. Proceedings of the in: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assa., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 291-318, (1972). 3 fig, 12 ref. OWRR A-024-ARIZ (7).

Descriptors: "Input-output analysis, "Stochastic processes, "Decision making, "Optimization, "Operation, Tesearch, Regulation, Reservoir operation, Linear programming, Dynamic programming, Simulation analysis, Mathematical studies, Probability, Numerical analysis, Streamflow, Watershed management, Computer programs.

New and improved methods of determining op-timal operating rules for reservoirs are progressive aspects of the past decade. Deterministic linear aspects of the past decade. Deterministic linear programming, deterministic dynamic programming, stochastic linear programming, stochastic dynamic programming and simulation are the major techniques. The use of discrete conditional dependency matrices as input to stochastic decision models is examined. Condistochastic decision models is examined. Conditional probabilities that are generated are not accurate. Approximation for numerical integration is required for input in dependence matrices. The real value of transforms for highly akewed streamflows may be realized when studying watersheds in an arid region. Meaningful conditional probability dependency matrices can be constructed to obtain an optimal operating policy for a reservoir. Problems and initial assumptions in the construction of matrices, the transform relating gamma space with normal space, a new transform for highly skewed data, and the possibility of using the matrices to provide realistic inputs to a stochastic dynamic program are discussed in detail. (See also W73-10818) (Popkin-Arizona)

CORRELATED STUDIES OF VANCOUVER CARE-HYDRAULIC MODEL STUDY,
Washington State Univ., Pullman. R.L. Albrook
Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W73-10881

CORRELATED STUDIES OF VANCOUVER LAKE - WATER QUALITY PREDICTION STU-

DY, Washington State Univ., Pullman. Dept. of Civil Engineering. For primary bibliographic entry see Field 05B.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Control of Water on the Surface—Group 4A

AQUATIC PLANT CONTROL PROGRAM. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Available from the National Technical Informa-tion Service as AD745 895, \$3.00 in paper copy, \$9.95 in microfiche. Proceedings Research Hanning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi. 175 p, 1972. 5 fig. 19 tab, 11 ref.

Descriptors: *Aquatic weed control, *Mechanical control, *Chemcontrol, Biocontrol, Louisiana, Mechanical equipment, Florida, Harvesting, Panama Canal, Texas, Beneficial use, Coastal marshes, Hazards, Costs, Water hyacinth, Environment, Standards, Alligatorweed, Estimated

Identifiers: Jacksonville (Fla), 'Weed Witch,' Car-

Problems resulting from the spread of water hyacinth and other aquatic plants and means for their control or eradication by mechanical, chemitheir control or eradication by mechanical, chemical, and biological methods, and past, present, and ongoing research were discussed at this conference. Presentations were made on 'Mechanical equipment used for aquatic plant control in Louisiana,' 'Current investigations in the Jacksonville District concerning mechanical harvesting of obnoxious aquatic plants,' 'Aquatic plant control in the Panama Canal,' 'Aquatic plant control program in Texas,' 'Beneficial aquatic plants in coastal areas,' 'Mechanical equipment 'Weed Witch' for aquatic plant control,' 'Summary of CO2 laser-water hyacinth laboratory research,' Field laser,' 'Facilities of the U. S. Army Corps of Engineers, Waterways Experiment Station libra-'Field laser,' 'Facilities of the U. S. Army Corps of Engineers, Waterways Experiment Station library;' Appendies include 'Aquatic plant control research project plan, F7-73-77, 'Cooperative research, U. S. Department of Agriculture,' 'Aquatic plant problems in Louisiana,' 'Mechanical harvesting of water hyacinths in Florida,' and 'Summary of CO2-laser control of aquatic plants.' (See W73-10952 thru W73-10963) (Auen-Wisconsin) cin) W72-10951

MECHANICAL EQUIPMENT USED FOR AQUATIC PLANT CONTROL IN LOUISIANA,

Army Engineer District, New Orleans, La. W. E. Thompson.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 5-11, 1972.

Descriptors: *Aquatic weed control, *Mechanical control, *Louisiana, Equipment, Costs, Disposal, Harvesting.

Louisiana uses several mechanical methods to control aquatic weeds in its 10,000 miles of watercontrol aquatic weeds in its 10,000 miles of water-ways and 500,000 acres of wet lands infested with water hyacinth and alligator weed. A mechanical cropper boat has destroyed large areas of aquatic plants by piling them on banks. Drifting is frequently employed and is accomplished by driving a saw boat through the growth as close to the bank as possible and cutting the growth away from its anchorage; the floating mat is cut by the same equipment into pieces which are started downstream with the current, to salt water and destruction. To control free drifting vegetation from one stream to another and the drifting from feeder areas into main channels a system of booms and barricades located in the various waterways is utilized. A self-propelled, heavy-duty roll-crusher destroyer is also used; the vegetation is fed between its two rollers whose crushing action injures the plants precluding further growth. The saw-boat destroys growth by damaging the rhizome of water hyacinth making it incapable of propagation. Description of each method, costs, and effectiveness are described. (See also W73-10951) (Auen-Wisconsin) ways and 500,000 acres of wet lands infested with

CURRENT INVESTIGATIONS IN THE JACKSONVILLE DISTRICT CONCERNING MECHANICAL HARVESTING OF OBNOXIOUS

MECHANICAL HARVESTING OF ORNOXIOUS AQUATIC PLANTS, Army Engineer District, Jacksonville, Fla. Aquatic Plant Control Section; Florida Dept. of Natural Resources, Tallahassee; and Florida State Game and Fresh Water Fish Commission, Tal-lahassee.

ianasee. C. F. Zeiger, L. M. Curtis, and J. W. Wood. In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 13-16, 1972.

Descriptors: "Mechanical control, "Harvesting, "Aquatic weed control, Florida, Water hyacinth, Fertilizers, Pulp and paper industry, Disposal, Feeds, Soil amendments. Identifiers: "Utilization studies, Jacksonville (Fla), St. Johns River (Fla).

The Army Engineers, Jacksonville District, Florida, has been studying mechanical harvesting of aquatic weeds in cooperation with several state agencies and industries. The utilization studies include determination of possible use as a feed or feed supplement for livestock, with procedures for the best plant preparation and feeding trials; water hyacinth as a soil amendment with a study of its benefit to soil as partial or entire substitute for chemical fertilizer; the paper-making properties of water hyacinth with estimates of the market value of pulp made from hyacinth. To date water hyacinths as feed are more acceptable than hydrila or coastal Bermuda. Complete chemical analyses of water hyacinths and the soil amended with water hyacinths are to be made. A contract has been entered into for design of an experimenwith water hyacinths are to be made. A contract has been entered into for design of an experimental hyacinth harvester to be tested on the St. Johns River. One aspect of harvesting that could be investigated is the possibility of pumping harvested, chopped hyacinth from the harvester site to a disposal area. On a large-scale basis this would be much less expensive than trucking the plants. (See also W73-10951) (Jones-Wisconsin)

AQUATIC PLANT CONTROL IN THE PANAMA

Corps of Engineers, Philadelphia, Pa. Operations

Div. R. W. Lowry.
In: Proceedings Research Planning Conference on Aquatic Plant Control Project, January 12, 1972, Vicksburg, Mississippi, p 17, 1972.

Descriptors: Aquatic weed control, Mechanical control, Equipment, Panama Canal.

Mechanical removal of floating aquatic weeds from the Chagres River, main tributary of the Panama Canal, has proven to be successful. Huge islands of hyacinth and other noxious plants float down the river after heavy rains and are trapped by a log boom. When the boom is loaded, one end by a log boom. When the boom is loaded, one end is disconnected from the bank and powerful launches pull the free end upstream and across the river. Weeds caught on the boom are pushed into a basin where a Sauerman slackline operates. The 2-ton capacity bucket picks up the weeds and dumps them high on the bank where they decay and, eventually, are sufficiently dehydrated to burn. Experiments with mechanical removal of rooted emersed aquatic plants, such as elodea, and disposal by dump barges were not particularly successful. The physical laceration of the plants tended to have a cultivating effect on regrowth and the barges did not dump well in the water. (See also W73-10951) (Auen-Wisconsin) W73-10954

BENEFICIAL AQUATIC PLANTS IN COASTAL

AREAS, Army Engineer District, Mobile, Ala. For primary bibliographic entry see Field 03B. W73-10955

MECHANICAL EQUIPMENT 'WEED WITCH' FOR AQUATIC PLANT CONTROL, Army Engineer Div. South Atlantic, Atlanta, Ga. For primary bibliographic entry see Field 03B. W73-10956

SUMMARY OF CO2 LASER-WATER HYACINTH LABORATORY RESEARCH, Athens Coll., Ala. Dept. of Biology. For primary bibliographic entry see Field 03B. W73-10957

FIELD LASER, Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 03B. W73-10958

AQUATIC PLANT CONTROL RESEARCH PRO-JECT PLAN FY 73-77 (PPB REPORT), Corps of Engineers, Washington, D.C. For primary bibliographic entry see Field 03B. W73-10959

INTEGRATION OF BIOLOGICAL AND CHEMI-CAL CONTROL OF ALLIGATOR WEED, Agriculture Research Center, Fort Lauderdale, Fla. For primary bibliographic entry see Field 03B. W73-10960

AQUATIC PLANT PROBLEMS IN LOUISIANA, Army Engineer District, New Orleans, La. For primary bibliographic entry see Field 03B. W73-10961

MECHANICAL HARVESTING OF WATER HYACINTH IN SHELL CREEK RESERVOIR, CHARLOTTE COUNTY, FLORIDA, Florida State Game Freshwater Fish Commission, For primary bibliographic entry see Field 03B. W73-10962

EVALUATION OF AQUAMARINE CORPORA-TION MECHANICAL HARVESTER IN REMOVAL OF WATER HYACINTHS, ST. JOHNS RIVER, BLUFTON, FLA., Florida State Game Freshwater Fish Commission, For primary bibliographic entry see Field 03B. W73-10963

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1972. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-10980

FLOOD PLAIN INFORMATION-MEADOW CREEK, EAGLE RIVER, ALASKA. Army Engineer District, Anchorage, Alaska.

Flood Plain Report, April 1973. 26 p, 12 fig, 12 plate, 2 tab.

Descriptors: "Floods, "Flood data, "Flood damage, "Flood frequency, "Alaska, Flood discharge, Flood forecasting, Historic floods, Flood control, Land management, Planning, Streamflow, Stream gages.
Identifiers: "Eagle River (Alaska), "Meadow Creek (Alaska), Intermediate regional flood, Standard project flood

The portion of the community of Eagle River, Alaska, covered by this report is subject to flood-ing from Meadow Creek. The properties along this stream are primarily residential and have been

dard project flood.

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control of Water on the Surface

moderately damaged by the flood of August 1971. A history of flooding in Eagle River is presented and areas subject to possible future floods are identified. Special emphasis is given to these floods through maps, photographs, profiles and cross sections. The report does not provide solutions to flood problems; however, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and thereby prevent intensification of loss and damage. It will also aid in the identification of other flood damage reduction techniques such as works to modify flooding and adjustments, including flood proofing. (Woodard-USGS)

DRAINAGE COEFFICIENT FOR SURFACE DRAINAGE CUEFFICIENT FOR SURFACE DRAINAGE OF AGRICULTURAL LAND FOR DIFFERENT PARTS OF THE COUNTRY, Soil Conservation Research, Demonstration and Training Center, Debra Dunn (India). For primary bibliographic entry see Field 03F. W73-10997

4B. Groundwater Management

EVALUATION OF TECHNIQUES FOR SELECTING SITES FOR INDUCED INFILTRATION ALONG THE ALABAMA RIVER,
Geological Survey of Alabama, University,
Leon Scarbrough, and R. E. Kidd.
Available from the Neignal Technical Info Leon Scarbrougn, and R. E. Kidd. Available from the National Technical Informa-tion Service as PB-220 961, \$3.00 in paper copy, \$0.95 in microfiche. Geological Survey of Alabama, Circular 84, 1972. 77 p, 26 fig, 75 ref. OWRR A-014-ALA (1).

Descriptors: *Infiltration, *Induced infiltration, *Hydraulic conductivity, *Electrical resistivity, *Permeability, Aquifers, Alabama, *Aerial photography, Flood plains.
Identifiers: *Alabama River (Ala), Photogeography, *Shallow aquifers.

This study includes the application of photogeologic, geophysical and auger test-drilling methods in the flood plain of the Alabama River to locate and define deposits that would be good shallow aquifers having definite potential for hydraulic connection to the river. Aerial photographs were studied to assist in locating abandoned river channels and other areas in which shallow aquifers might exist. Prospective areas were then delineated, and geophysical studies and an auger test drilling program were implemented. Refraction seismic and electrical resistivity methods were used to attempt to locate sand and/or gravel deposits. Electrical resistivity became the primary geophysical method used when experience indicated that sand and gravel deposits were more resistive than the associated clay and silt deposits. Sand, gravel and clay deposits were located and resistive than the associated clay and silt deposits. Sand, gravel and clay deposits were located and mapped with the electrical resistivity instrument. The difference in conductivity between sand and gravel is very slight; therefore, it is difficult to determine if a deposit contains only sand or if it contains sand and gravel. Abandoned channels were located and the thickness of sand and gravel bodies were determined from seismic and auger test-drilling data.

W73-10401

AN ECONOMIC MODEL OF AN AREA'S RESPONSE TO DEPLETION OF ITS WATER

Kansas Water Resources Research Inst., Manhat-

un.
R. W. Ruppert, and G. S. Clausen.
Available from the National Technical Information Service as PB-220 962, \$3.00 in paper copy,
\$0.95 in microfiche. Contribution No 116,
December 1972, 30 p, 5 fig, 2 tab, 10 ref. OWRR
A-035-KAN (1). 14-31-0001-3216.

Descriptors: Groundwater mining, "Alternative planning, Income, "Kansas, Water transfer, Model studies, Irrigation efficiency, Benefits, Alternative water use, Water utilization. Identifiers: "Economic models, "Groundwater Aspletion."

Irrigation development has led many areas to depend upon mining of local groundwater for considerable proportions of their income. As groundwater depletion takes place these areas can develop alternative supplies, instigate economically advantageous transfers, or incur reductions in population and income because of migration. A conceptual economic model is presented for determining the appropriate combination of the alternatives for an area to use and the way in which the combination should be varied over time as the depletion continues. Little emphasis is placed on empirical findings for case study areas, however, some detailed work is presented on migration habits to be expected in Western Kansas.

GEOHYDROLOGIC RECONNAISSANCE AND STUDY PLAN FOR WATER RESOURCES INVESTIGATIONS IN THE BARODA-BROACH AREA, GUJARAT, INDIA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04A. W73-10439

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 2, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING, Geological Survey, Lakewood, Col. G. A. Dinwiddie. Available from NTIS, Springfield, Va 22151, USGS-474-142 Price \$4.00 printed copy; \$0.95 microfiche. Geological Survey Publication USGS-474-142, April 1973. 32 p, 13 fig, 1 tab, 2 ref. AEC At (29-2)-474.

Descriptors: "Hydraulics, "Water quality, "Test wells, "Wyoming, Water yield, Pumping, Draw-down, Transmissivity, Pressure head, Water anal-ysis, Chemical analysis, Fluid mechanics, Oil in-dustry, Groundwater recharge. Identifiers: "Sublette County (Wyo).

Wagon Wheel Water Well No. 2 was drilled to obtain hydraulic data at the site of Project Wagon Wheel, a Plowshare Project in the Green River basin of Sublette County, Wyoming. Two intervals in the 5,200-foot hole were hydraulically tested and samples of water were obtained. Results of testing the upper interval, near the 2,300-foot level, indicate that transmissivity is about 710 gallons per day per foot, and that the static water level, after correction for density, is 99.4 feet below land surface. Water from this upper interval is fresh. Results of testing the lower interval, near the 5,000-foot level, indicate that transmissivity is about 5.4 gallons per day per foot, and that the the 5,000-foot level, indicate that transmissivity is about 5.4 gallons per day per foot, and that the static water level, after correction for density, is 56.4 feet below land surface. Water from this lower interval is highly saline. Pressure head increases with depth, indicating the potential for upward movement of fluid. However, the great difference in chemical quality of fluid samples collected from the two tested intervals indicates that significant vertical movement of fluid upward is unlikely in the vicinity of the well. (Woodard-USGS) USGS W73-10445

BEHAVIOR OF GROUNDWATER FLOW SUB-JECT TO TIME-VARYING RECHARGE, Water Resources Engineers, Inc., Springfield, Va. For primary bibliographic entry see Field 02F. W73-10662

MATHEMATICAL SIMULATION OF THE SUB-SIDENCE OF VENICE: 1. THEORY, Centro di Ricera IBM di Venezia (Italy).

For primary bibliographic entry see Field 02F. W73-10663

FATE OF SUSPENDED SEDIMENT DURING BASIN RECHARGE, Southwestern Great Plains Research Center, Bushland, Tex. For primary bibliographic entry see Field 02J. W73-10668

ASSESSMENT OF GEOTHERMAL ENERGY RESOURCES. Department of the Interior, Washington, D.C. Panel on Geothermal Energy Resources. For primary bibliographic entry see Field 06B. W73-10696

NOTES ON DEVELOPING GROUND WATERS, International Water Supply Association, Montreal (Quebec). P. O. Bourgeois. Water and Pollution Control, Vol 110, No 10, p 24-28, October, 1972. 5 fig.

Descriptors: Groundwater, "Groundwater availability, "Groundwater recharge, Groundwater mining, Infiliration galleries, Recharge, Pollution, Septic tanks, Effluents, Chlorination, Soil filters, Surveys, "Test wells, Wells, Water wells. Identifiers: "Horizontal wells, Cone of depression, "Record keeping, Ground water pollution, Test numping

Test pump

Test pumping.

Advantages in developing ground water resources over surface waters for water supply and some methods for doing so are briefly discussed. Principles of artificial recharge, induced infiltration, and ground water recirculation are given. It is emphasized that well construction should be executed properly—and that when constructed by competent conscientious experts, a well should be a work of art and engineering. Analysis of geological conditions forms the first part of a ground water development program. Test drilling and pumping, to establish actual transmissivities, individual well potential yields, and complete well field yields, is then carried out. Horizontal wells and infiltration galleries are mentioned, to which the same general hydrologic and geophysical laws apply as to vertical wells. Ground water pollution is discussed, with detergent effluents from septic tanks singled out as a major pollutant. The value of record-keeping by the individual drilling or owning a well or well field is emphasized. (Smith-NWWA) W73-10711

GAS IN GROUND WATER.

Journal of the American Water Works Association, Vol 61, No 8, p 413-414, August, 1969.

Descriptors: Groundwater, *Methane, Gases, Hydrogen sulfide, *Explosions, Gravels, Glacial sediments, Ventilation, *Decomposing organic atter. Aeratic Identifiers: Gas-air mixture, *Flammable gases

A summary of gas characteristics in ground water is given in order to acquaint water utilities employees and others with its nature, origins, and hazards. Both methane and hydrogen sulfide are common flammable gases found in ground water, the latter being less dangerous because it has a distinctive odor. Examples of isolated explosions attributed to gas in ground water occurring in Michigan and New York State, as well as a possible one in Louisiana, are mentioned. The minimum concentration of methane in water sufficient to produce an explosive methane-air mixture (3-15) per cent methane in a gas-air mixture) above the water from which it evolves can be as little as 1.1 ppm at normal conditions, in poorly ventilated air spaces. Under these conditions explosions can occur in shower stalls, water treatment plants,

storage reservoirs, water tanks, and other poorly ventilated air spaces. Suffocation is another hazard of gas in ground waters. Safety measures for decreasing the hazards include aeration of the water before use, and adequate ventilation of air spaces around the well in places where the water is to be used. (Campbell-NWWA)

WELL OPERATION, Madison Water Utility, Wis. For primary bibliographic entry see Field 08A. W73-10714

CONTROLLING FLOWING ARTESIAN WELLS,
Bureau of Reclamation, Denver, Colo. Div. of
Drainage and Groundwater Engineering.
For primary bibliographic entry see Field 08A.
W73-10718

ELECTROMAGNETIC DEPTH SOUNDING EX-PERIMENT ACROSS SANTA CLARA VALLEY, California Univ., Berkeley. Dept. of Geoscience

Engineering.
J. Ryu, H. F. Morrison, and S. H. Ward.
Geophysics Vol 37, No 2, p 351-374, April 1972. 25
fig. 16 ref. OWRR B-067-CAL (3). 14-31-00011878.

Descriptors: *Electromagnetic waves, *California, Measurement, *Remote sensing, Depth. Identifiers: *Santa Clara Valley (California).

An electromagnetic depth sounding experiment with a horizontal loop carrying an oscillating cur-rent was carried out in Santa Clara Valley, Califorrent was carried out in Santa Clara Valley, California. The field data are interpreted in terms of the polarization parameters of the magnetic polarization ellipse. The chosen parameters are tilt-angle, ellipticity, and the modulus of wave-tilt. The electrical discontinuities deduced are in general agreement with well data and with a geologic section based on resistivity soundings. The results clearly reveal an intermediate, highly resistive layer, which is a permeable stratum for groundwater recharge. It is concluded that a portable electromagnetic sounding system, measuring only tiltangle and ellipcity, should easily locate highly resistive gravel deposits bounded by conductive clay beds. The system is useful in those regions where it is extremely difficult to inject current into the ground. ground. W73-10720

ROLE OF CONNECTICUT RIVER FLOOD FLOWS IN RECHARGING GROUND-WATER FORMATIONS, Massachusetts Univ., Amherst. O. C. Farquhar. In: Formation of Public Policy on Issue of Out-of-

In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area. Mas-sachusetts Water Resources Research Center, Publication No. 25, 1973, Appendix G, 3 p. OWRR C-2169 (No. 3377) (1).

Descriptors: *Groundwater, *Groundwater recharge, Flood flow, *Diversion, Water levels, *Aquifer systems, *Connecticut River, *Inter-basin transfers.

The effect of flood water diversions from the Con-The effect of flood water diversions from the Con-necticut River on groundwater recharge is ex-plored. An extensive system of aquifers is linked to the Connecticut River and these aquifers not only provide public water supply but also help maintain a base flow in the river. A study of the available literature on proposed diversions from the Connecticut River up to the year 2020 shows that the level of the river could be reduced from .2 ft. to 1.6 feet. This decrease in river stage would be much less in the State of Connecticut and in any case is quite small compared to daily fluctuations due to the operation of small impoundments for industrial purposes. Thus, it is concluded that the flood water diversions would have no adverse effect on the aquifers in the basin. (See also W73-10726). (Elfers - North Carolina).

GROUNDWATER RESOURCES OF COKE COUNTY, TEXAS, Geological Survey, Austin, Tex. C. A. Wilson. Texas Water Development Board, Austin, Report 166, March 1973. 87 p, 15 fig, 7 tab, 45 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water wells, *Texas, Water yield, Pumping, Water utilization, Industries, Irrigation, Domestic water, Livestock, Water quality, Salinity, Chemical analysis, Oil industry, Brines, Water pollution sources, Groundwatersenberg, water recharge. Identifiers: Coke County (Tex).

Identifiers: Coke County (Tex).

Coke County, located in semiarid west-central Texas, where large ranches, small farms, and oil production are the main bases of the economy, has a small supply of groundwater and surface water. Of the approximately 1,900 acre-feet of fresh to moderately saline groundwater used in 1968, industry used 880 acre-feet, irrigation used 210 acre-feet, and domestic supply and livestock used 820 acre-feet. All of the water for municipal supply and some of the water for industry is obtained from surface-water reservoirs. The oldest geologic units cropping out in the county are the westward-dipping Permian 'red beds'. Groundwater in the Permian rocks is usually of the calcium-magnesi-um and sulfate or bicarbonate type. Most of the water samples in the Permian rocks contained more than 1,000 mg/liter dissolved solids. The most favorable areas in the county where well yields exceeding 50 gpm can be expected are: (1) in the floodplain alluvium in the southwestern corner of the county; and (3) in the southwestern part of the county near Tennyson, where wells may penetrate solution openings and fractures in the dolomitic beds of the Clear Fork Group. (Woodard-USGS)

HYDROGEOLOGY AND ENGINEERING GEOLOGY (GIDROGEOLOGIYA I INZHENER-NAYA GEOLOGIYA). For primary bibliographic entry see Field 02F.

'IRON WATER' FROM WELLS: CAUSES AND PREVENTION,

Geological Survey, Austin, Tex. M. E. Broom. Ground Water, Vol 4, No 1, p 18-21, January, 1966. 1 fig, 5 ref.

Descriptors: Wells, "Water wells, "Groundwater, "Iron, Oxidation, Reduction (Chemical), "Texas, Hardness (Water), Stratification, Oxidation-reduction potential, Geochemistry, Domestic water, Aquifer characteristics, Zoning. Identifiers: Iron stains.

Chemical analyses of ground-water samples taken from differing depths in a four-county area in east Texas showed a general stratification with respect to dissolved iron, pH and hardness. On the basis of to dissolved iron, pH and hardness. On the basis of this stratification the waters of the groundwater reservoir were divided into a shallow zone of ox-idation, A; a deep zone of reduction, C; and an in-termediate and unstable zone, B, in which waters from above and below are mixed. Groundwater from zones A and C generally is almost free of iron, whereas water from zone B generally con-tains objectionable amounts. This zoning is explained by recent laboratory work and theoretical data on iron in natural waters. Wells constructed to draw only from zones A or C should yield water relatively free of iron. (Campbell-NWWA) W73-10782.

RFFICIENCY OF VARIOUS METHODS OF DRILLING WELLS FOR WATER SUPPLY, For primary bibliographic entry see Field 08A. W73-10789

GEOHYDROLOGY, Kennecott Copper Corp., Lexington, Mass. A. D. Permichele. Mining Engineers, Vol 25, No 2, p 67-68, February, 1973. 6 ref.

Mine drainage, Descriptors: *Mine acids, Mine drainage, *Mineral industry, Leaching, *Environmental efects, Research and development, Waste dumps, Acids, Groundwater, Resistivity, Tracers, Copper, Hydrogeology, Illinois, Wisconsin. Identifiers: Ore bodies, Uranium.

Use of the science of geohydrology to contribute to solution of a variety of problems related to mining, such as slope stability, in situ leashing, dump leaching and land rehabilitation, is expanding rapidly. The potential for damage to groundwater and surface water resources must be routinely considered when evaluating, planning and designing projects related to mining. Laws of Illinois and Wisconsin relating to permits for mining in order to control and avoid damage to the environment are oulined. EPA studies of the effects on groundwater of in situ leaching of copper ore are given. Current research and projects in connection with environmental factors of mining are described. The emphasis for the next few years will be on analysis of environmental impact as the industry is brought under increased pressure to minimize the effects of mining on the environment. (Smith-NWWA)

SEISMOGRAPH AND RESISTIVITY USE IN SHALLOW GROUNDWATER SEARCH, Layne-Northwest Co., Milwaukee, Wis. For primary bibliographic entry see Field 08G. W73-10793

THE HEALTH AND CARE OF WELLS, Universal Oil Products, St. Paul, Minn. Johnson For primary bibliographic entry see Field 08B. W73-10794

DRILLING FOR WATER IN NEW ENGLAND, Geological Survey, Montpelier, Vt. For primary bibliographic entry see Field 08A. W73-10796

DEVELOPMENT OF SAND AND GRAVEL AQUIFERS, For primary bibliographic entry see Field 08A. W73-10798

GROUNDWATER WELLS SERVE MINING IN-DUSTRY, Universal Oil Products, St. Paul, Minn. Johnson For primary bibliographic entry see Field 08A. W73-10799

THE GROUNDWATER SUPPLY OF LITTLE CHINO VALLEY, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 02F.
W73-10824

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

AN INVESTIGATION OF THE SESMIC WAVE PROPAGATION PROPERTIES OF A THIN UN-SATURATED LAYER AS A WAVE GUIDE, Michigan State Univ., East Lansing. Dept. of

M. Sc Thesis, 1971. 116 p, 26 fig, 2 tab, 15 ref. OWRR B-006-MICH (4). 14-01-0001-1513.

Descriptors: "Seismic waves, "Seismology, *Earthquakes, "Michigan, "Exploration. Identifiers: "Seismic refraction model (Three-layer), Udell experimental forest, Outwash plains, Morainal features, Michigan formation.

Three-component recording can provide informa-tion about a surface layer that would be missed in conventional vertical recording. A more accurate compressional velocity determination in the surface layer and the discovery of a surface wave re-lated to the direct arrival resulted from analysis of the three-component data. Plots of the magnitude of particle velocity without reference to direction are useful in the interpretation of three-component seismic signals. The method is new and is potentially valuable in recognizing some seismic arrivals tially valuable in recognizing some seismic arrivals that might otherwise be overlooked. The surface wave discovered through the use of this method apparently has not been reported in the literature. Its propagation is linked to the wave guide properties of a relatively thin surface layer with a low velocity relative to the underlying material. It is identified on an observational basis by its elliptical particle motion and its arrival time. It can be predicted at least in a qualitative sense from the theory of seismic ray propagation. Some aspects of seismic theory related to phase changes upon reflection have been experimentally confirmed. A phase reversal occurs with reflection from a free surface and no phase change occurs with reflection from a free surface and no phase change occurs with reflection from a free surface and no phase change occurs with reflec-tion from an interface with material having a higher acoustic impedance. (Richardson-Michigan State) W73-10888

UNSTEADY FLOW TWOARD AN ARTESIAN

Kentucky Univ., Lexington. Dept. of Civil En-

Water Resources Research, Vol 9, No 2, p 426-433, April 1973. 6 fig. 1 tab, 7 ref. OWRR A-042-KY (2) B-002-KY (3).

Descriptors: *Finite element analysis, *Unsteady flow, *Artesian wells, *Drawdown, Hydraulic models, Computer programs, Groundwater movement, Artesian aquifers.

Unsteady drawdown around an artesian well may be calculated using a finite element method programmed for a high-speed computer. On the basis of assumptions that the well has a finite radius and that the discharge from a partially penetrating well is not uniform along the well bore, numerical solutions for various well penetrations are presented and compared with the experimental measurements from a sand model. The numerical solutions check reasonably with the experimental measurements. check reasonably with the experimental measurements. (Knapp-USGS)

EFFECT OF A WATER TABLE AQUITARD ON DRAWDOWN IN AN UNDERLYING PUMPED

Water Resources Research, Vol 9, No 2, p 434-447, April 1973. 5 fig, 27 ref. OWRR A-045-NEV

Descriptors: *Ground water movement, *Aquitards, *Drawdown, Saturated flow, Artesian aquifers, Water yield, Unsaturated flow, Equations, Confined water, Storage coefficient.

The vertical velocity at the base of a water table aquitard having negligible compressibility may be described by a convolution integral either theoretically derived or yielded by N.S. Boulton's originally empirical 'delayed yield' theory. The derivation requires that fluid compressibility be neglected and that water be obtained from storage by instantaneous desaturation (or saturation) with a declining (or rising) water table. An expression for the delay index shows that it is a function of hydraulic conductivity, specific yield, and thickness of the aquitard. To evaluate the effect that gradual desaturation may have on flow in a water table aquitard, flow in the unsaturated zone was approximated by an analytical solution of Richards' equation assuming time invariant power law functions for change of both capillary conductivity and moisture content in the vertical. An equation was derived that shows that the length of time for which gradual desaturation could influence flow in the saturated zone is a function of the hydraulic conductivity and specific yield of the aquitard and the thickness of the capillary fringe. To investigate the effect that delayed yield could have on flow in the aquiter, analytical solutions were made for flow to a well pumping at a constant rate in a compressible aquitard. Comparison of results that consider delayed yield effects withose that do no suggests that the unsaturated zone has little effect on flow in the aquifer. (Knapp-USGS) USGS) W73-10968

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1972.

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-10980

WATER-LEVEL DECLINE AND PUMPAGE IN DEEP WELLS IN NORTHERN ILLINOIS, 1966-

Illinois State Water Survey, Urbana. R. T. Sasman, C. R. Benson, G. I. Dzurisin, and N. E. Risk. Circular 113, 1973. 41 p, 10 fig, 4 tab, 10 ref, ap-

Descriptors: *Water levels, *Drawdown, *Deep wells, *Aquifer characteristics, *Illinois, Hydrogeology, Water utilization, Water supply, Municipal water, Industrial water, Domestic water, Pumping, Water yield, Water level fluctuations, Hydrologic data, Basic data collections, Reviews, Evaluation.

Identifiers: Northern Illinois wells, *Water level

Trends in water levels and pumpage from deep wells in northern Illinois are summarized from records for the end of 1966 through 1971. The wells in northern Illinois are summarized from records for the end of 1966 through 1971. The Cambrian-Ordovician aquifer is encountered at depths ranging from less than 100 feet in areas of northwestern Illinois to an average of about 500 feet below land surface at Chicago; it has an average thickness of 1,000 feet and is composed chiefly of sandstones and dolomites. During the period from 1966 through 1971, pumpage from deep wells increased to 239.0 mgd, an increase of 23.6 mgd or 11% more than the 1965 pumpage. Pumpage in the Chicago region increased to 150.7 mgd, an increase of 12.5% since 1966. This increase has resulted in excessive water-level declines in some deep wells. For the Chicago region, average annual water-level declines during the 5-year period ranged from 4 feet in Grundy County to 14 feet in Lake County and averaged about 9 feet. Water levels in 11 selected observation wells outside the Chicago region declined an average of 1 foot per year during the same period. If the distribution of pumpage remains the same and pumpage continues to increase, the principal water-yielding units of the aquifer will be partially dewatered in many areas much sooner than previously anticipated. (Woodard-USGS) FORMATION OF CAVITY IN CONFINED AQUIFER, Indian Inst. of Tech., Kharagpur. Dept. of Agricul-For primary bibliographic entry see Field 08B.
W73-10996

4C. Effects on Water of Man's Non-Water Activities

THE ORIGIN, EFFECTS AND CONTROL OF TURBIDITY IN AN URBAN RECREATIONAL

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Massachusetts Univ., Amherst. Water Resources Research Center. For primary bibliographic entry see Field 05B. W73-10406

THE INFLUENCE OF BENTHIC BARK DEPOSITS ON AQUATIC COMMUNITY AND THE QUALITY OF NATURAL WATERS, Oregon State Univ., Corvallis. Water Resources Research Inst.

F. D. Schaumburg, and J. Walker. Available from the National Technical Informa-

Solution Service as PB-220 952, \$3.00 in paper copy, \$0.95 in microfiche. Final Research Report: May 1973, 24 p, 8 fig, 2 tab, 11 ref. OWRR A-012-ORE

Descriptors: *Bark, Estuaries, *Lumbering, Food chains, *Benthos, *Oregon. Identifiers: *Yaquina Bay.

The water storage and transport of logs is com-monplace in the Pacific Northwest. The effect of monplace in the Pacific Northwest. The effect of bark deposits on the benthic ecosystem, including numerous species of macro-invertebrates, was investigated. These and other organisms are important links in the food chain for fish and shellfish which inhabit lakes, streams, and estuaries used for log storage. Based upon the results of this study, bark deposits appear to have little or no detrimental effect on the benthic macro-invertebrates which inhabit Yauning Estuary. Under different mental effect on the beatture macro-invertebrates which inhabit Yaquina Estuary. Under different situations such as those in which negligable water movement is available above bark deposits, the increased oxygen demand of the bark might affect the water column to the extent that a decrease in the beatth former would make the benthic fauna would result.

SEDIMENT TRANSPORT BY STREAMS DRAINING INTO THE DELAWARE ESTUARY, Geological Survey, Philadelphia, Pa. For primary bibliographic entry see Field 02L. W73-10425

EFFECTS OF URBANIZATION OF SEDIMEN-TATION AND FLOODFLOWS IN COLMA CREEK BASIN, CALIFORNIA,

Geological Survey, Menlo Park, Calif. J. M. Knott.

Geological Survey open-file report, February 22, 1973. 54 p, 20 fig, 18 tab, 10 ref.

Descriptors: *Sediment transport, *Land development, *Urbanization, *California, Sediment yield, Floods, Streamflow, Hydrologic data, Data collections, Stream gages, Sampling, Suspended solids, Sedimentation, Correlation analysis, Environmental of Sedimentation, Control tal effects, Geology, Topography, Vegetation, Land use, Rainfall-runoff relationships. Identifiers: *Colma Creek basin (Calif.).

Some of the changes are described in water and Some of the changes are described in water and sediment discharge that occurred in the Colma Creek basin in California during a period of major urban expansion. Hydrologic data collected from 1964 to 1971 were used to evaluate trends and relations between sediment yield and land use. Total sediment yield upstream from the Colma Creek gaging stations ranged from 3,400 to 14,000 tons per square mile during 1966-70. Sediment discharge rates of Spruce at South San Francisco were relatively stable in 1966-67, but increased charply in 1968 and 1969 owing to increased construction activity and to sediment losses from a debris basin which was breached several times during large storms. Annual suspended-sediment yield upstream from the Spruce Branch gaging station ranged from 2,800 to 39,000 tons per square mile during the period 1966-69. Future sediment yields of the Colma Creek basin will undoubtedly be lower than yields observed during the study period when construction activity was high. If the basin becomes completely urbanized (65% urban and 35% open space), it is probable that sediment yields for the entire basin will range from 9,700 tons in a year of average rainfall to 25,000 tons in a year of extremely high rainfall. (Woodard-USGS) W73-10653

GUIDELINES FOR HYDRAULIC CONSIDERA-TIONS IN HIGHWAY PLANNING AND LOCA-TION.

TION.
American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design.
For primary bibliographic entry see Field 08B.
W73-10657

GUIDELINES FOR HYDROLOGY. American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design, For primary bibliographic entry see Field 08B. W73-10658

UNDERGROUND CORROSION AND SALT IN-FILTRATION, Connecticut Univ., Storrs, Dept. of Civil En-

gineering.
P. M. Berthouex, and G. A. Prior.
Journal of the American Water Works Association, Vol 60, No 3, p 345-356, March, 1968. 6 fig, 27 ref.

Descriptors: Corrosion, Corrosion control, Electrolytes, *Salts, *Highway icing, Leaching, Chlorides, Calcium chloride, Sodium chloride, Resistivity, Soil chemistry, *Soil water movement. Identifiers: Buried pipes, *Galvanic cells.

Identifiers: Buried pipes, *Galvanic cells.

The mechanism of salt penetration into the soil and the possible effects of infiltrated salts on underground corrosion are discussed. Soil samples from an area along a main New England highway were obtained at distances of 5, 25, 50, and 100 ft. from the edge of the paved shoulder. At each of these locations soil samples were taken from the surface and at depths of 1/2, 1, 2 and 3 ft. Three snowfalls had occurred before sampling was initiated. Greatest salt concentrations were found near the highway, with the highest concentration decreased with depth, and the fluctuations in salt concentration were smaller at greater depths. Infiltrated salts will decrease the soil resistivity and generally promote increases in corrosion rates. Also, the natural leaching process produces concentration differences over narrow depths which can create galvanic cell corrosion, the importance of which will depend upon the stability of the anode location. These effects are related to soil drainage. (Smith-NWWA)

ANNOTATED BIBLIOGRAPHY AND COM-MENTS ON SEDIMENTATION IN THE CON-MENTS ON SEDIMENTATION IN THE C MECTICUT RIVER, Vermont Univ., Burlington. For primary bibliographic entry see Field 02J. W73-10728

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

SPECTROGRAPHIC ANALYSIS OF METALS IN FRESHWATER SEDIMENTS, Eastern Michigan Univ., Ypsilanti. Dept. of

Chemistry.

S. W. Brewer, Jr.

Available from the National Technical Information Service as PB-220 949, \$3.00 in paper copy, \$0.95 in microfiche. Project Completion Report, Michigan Institute of Water Research, State University, May 1973. 38 p, 5 fig. 11 tab, 9 ref.

OWRR A-056-MICH (1). 14-31-0001-3522.

Descriptors: *Spectroscopy, *Michigan, Analyti-cal techniques. Identifiers: *Huron River (Mich), *Atomic absorp-tion analyses, Graphite spark technique.

Sediment samples were collected along the entire Huron River. In order to develop analytical procedures, samples from sites near Ypsilanti were selected. These samples were analyzed qualitatively by de arc spectroscopy, and showed Al, Si, and Mg present at levels>1%, Fe present at roughly 0.1%, Mn present at < 0.1%, and Cu and Zn present at lower levels than Mn and Pb present at trace levels. Atomic absorption analyses of leach liquors from these sediments show good correspondence with the arc results for Fe, Mn, Cu, and Cr. High-voltage spark studies, using the graphite spark technique are in progress, and indicate that detection of 0.5 ppm of metal in a 0.775 ml sample of leach liquor is feasible.

DETERMINATION OF NANOGRAM LEVELS OF SILVER IN SUSPENDED MATERIALS OF STREAMS RETAINED BY A MEMBRANE FILTER WITH THE 'SAMPLING-BOAT' FILTER WITH THE SAMPLING-BUTECHNIQUE, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 02K. W73-10429

A RAPID SENSITIVE METHOD FOR THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF POLLUTED WATERS, Oak Ridge National Lab., Tenn. W. W. Pitt, Jr., S. Katz, and L. H. Thacker. Available from NTIS, Springfield, Va. 22151 as CONF-720827-2 Price \$3.00 printed copy; \$0.95 microfiche. Prepriat presented at 73rd National Meeting of the American Institute of Chemical Engineers, August 30, 1972, Minneapolis, Minnesott. Atomic Energy Commission, Oak Ridge National Laboratory Publication, 1972. 20 p., 7 fig, 2 tab, 1 append.

Descriptors: *Chemical analysis, *Water analysis, *Chemical oxygen demand, *Pollutant identification, *Fluorometry, Methodology, Analytical techniques, Correlation analysis.

A rapid, sensitive cerate oxidative method for measuring the chemical oxygen demand (COD) of waters is described. The pollutants are oxidized with perchlorato-cerate reagent and the resulting cerium (III) is determined fluoremetrically. Analysis requires only a few minutes for determination at levels as low as 100 micrograms of oxygen demand per liter. Results of tests on solutions of known organic compounds, various industrial waste streams, and natural waters show that the method compares favorably with the dichromate reflux procedure recommended by APHA. However, the new method is considerably faster and easier to use, and is a hundred times more sensitive. An analytical system which is suitable for use

as either a continuous COD monitor or as an analyzer for multiple samples in series is described also. (Woodard-USGS) W73-10434

THE DETERMINATION OF VANDIUM IN BRINES BY ATOMIC ABSORPTION SPEC-TROSCOPY, Geological Survey, Washington, D.C. H. J. Crump-Wiesner, H. R. Feltz, and W. C.

Purdy. Analytica Chimica Acta, Vol 55, p 29-36, 1971. 2 fig, 2 tab, 14 ref.

Descriptors: *Chemical analysis, *Trace elements, *Brines, *Analytical techniques, Metals, Spectrophotometry, Water chemistry, Spectroscopy, Methodology, Laboratory tests.

Identifiers: *Vanadium determinations, Triisooctyl thiophosphate, Methyl isobutyl ketone.

A standard addition method is described for the determination of vanadium in brines by atomic absorption spectroscopy with nitrous oxide-actylene flame. Sample pH is adjusted to 1.0 with concentrated hydrochloric acid and the vanadium is directly extracted with 5% cupferron in methyl isobutyl ketone (MIBK). The ketone layer is then expressed into the flame and the recorded absorpaspirated into the flame and the recorded absorption values are plotted as a function of the concentration of the added metal. As little as 2.5 microtrauon of the added metal. As little as 2.5 micrograms/liter of vanadium can be detected under the conditions of the procedure. Tungsten and tin interfere when present in excess of 5 and 10 micrograms/liter, respectively. The concentrations of the two interfering ions normally found in brines are well below interference levels. (Woodard-USGS) W73-10442

MERCURY POLLUTION AND LAKE ERIE

FISHES, Michigan State Univ., East Lansing. C. S. Annett, M. P. Fadow, F. M. D'itri, and M. E.

Stephenson.
Michigan Academician, Vol 4, No 3, p 325-337,
Winter 1972. 3 fig, 2 tab, 26 ref.

Descriptors: Water pollution sources, *Mercury, *Lake Erie, *Fish, *Sediments, Chemical analysis, Analytical techniques, Pollutant identification, Industrial wastes, Aquatic environment.

Various sources of mercury contribute to the mer-cury contamination of Lake Erie in the vicinity of the Raisin River. To assess their extent, 79 fish and 37 sediment samples collected from this area of Lake Erie during the fall season of 1970 were of Lake Eric during the fall season of 1970 were analyzed by flameless atomic spectrophotometric techniques. The average concentration of total mercury in the muscle tissue of several species of fish ranged from 0.06 to 1.7 ppm on a wet weight basis, and total mercury concentrations in the sediments ranged from 0.19 to 0.53 ppm on a dry weight basis. No relationship appears to exist between the size of the fish and its total mercury content within a given species. However, a trend content within a given species. However, a tren in mercury accumulation can be distinguishe among species. The mean total of mercury levels has a declining order in perch, goldfish, and carp with values of 0.49, 0.28, and 0.19 ppm of mercury, respectively. (Woodard-USGS)

CORRELATION OF OILS AND OIL PRODUCTS

CORRELATION OF OILS AND OIL PRODUCTS BY GAS CHROMATOGRAPHY, Woods Hole Oceanographic Institution, Mass. O. Zafiriou, M. Blumer, and J. Myers. Available from the National Technical Information Service as PB-211 337, 33.00 in paper copy, 30.95 in microfiche. Technical Report No. WHOI-72-55, July 1972. 101 p, 5 fig, 11 tab, 5 append. Contract No. EPA 15080 HEC.

Group 5A-Identification of Pollutants

Descriptors: "Oil pollution, "Chemical analysis, "Pollutant identification, "Oil spills, Weathering, Methodology, Oily water, Separation techniques, Water pollution, Water analysis, Gas chromatography, Monitoring, Variability, "Maine, "New York, Chemistry, Water quality, Geochemistry, Distillation, Evaporation, Oxidation, Water sampling, Bottom sampling, Sediments, Aquatic life, Solvent extractions, Benthos, Mass spectrometry.

Identifiers: "Oil characterization, "Oil fingerprinting, "Flame ionization gas chromatography, Crude oil, Chemical composition, Fuel oil, Sample storage, Sample preparation, Data interpretation, Environmental samples, Chromatographic columns, Aromatic hydrocarbons, Aliphatic hydrocarbons, Olefins, Pristane, Phytane, Dissolution, Bachaquero crude oil, Diesel oil, n-Paraffins, Column chromatography, GC-Mass spectrometry, Squalene.

Environmental samples of oil and oil products can be correlated with possible sources by comparison of their stable compositional features. Procedures for correlating samples with suspected sources by gas chromatographic analysis under standardized conditions are presented in manual form. A high rate of success for the method in realistic situations is estimated by analyses of artificially aged oils and of potential spill sources found in Greater New York Harbor and Portland, Maine. The method is suitable for routine use for weeks-old oil samples, and for monitoring levels of hydrocarbons in organisms and sediments. Slightly modified, it can be used in low-level and research work studying the fate and effects of petroleum hydrocarbons. (Holoman-Battelle)

ENHANCEMENT OF NET PRIMARY FRODUC-TIVITY BY HERBIVORE GRAZING IN AQUATIC LABORATORY MICROCOSMS, State Univ. of New York, Binghamton. Dept. of Biological Sciences. For primary bibliographic entry see Field 05C. W73-10460

DIURNAL PERIODICITY IN THE PHYTOPLANKTON ASSEMBLAGE OF A HIGH MOUNTAIN LAKE,

Innsbruck Univ. (Austria). Inst. of Zoology. For primary bibliographic entry see Field 05C. W73-10461

ANALYSES OF DREDGED WASTES, FLY ASH, AND WASTE CHEMICALS - NEW YORK METROPOLITAN REGION, State Univ. of New York, Stony Brook. Marine

Sciences Research Center. M. G. Gross.

Available from the National Technical National Information Service as AD-734 337, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No 7, October 1970. 33 p, 8 fig, 8 tab, 21 ref. Contract No. DACW-72-70-C0009.

Descriptors: *Sediments, *Heavy metals, *Oxidation-reduction potential, *Chemical analysis, *Sewage sludge, *Chemical wastes, Carbon, Cobalt, Chronium, Cooper, Manganese, Nickel, Lead, Zinc, Titanium, Aluminum, Iron, Magnesium, Calcium, Sodium, Potassium, Tracers, Waste identification, *New York, Industrial wastes, Fermentation, Distribution patterns, Water pollution effects.

Identifiers: Characterization, *Pharmaceutical wastes, *Fly ash, Silver, Boron, Barium, Tin, Vanadium, Silicon.

A study of solid wastes commonly dumped in the ocean near New York Harbor was designed to obtain information on the physical and chemical characteristics of the materials for use in determining types, distribution, and movement of the

wastes and for controlling deleterious effects. Wastes were sampled from a wide variety of sources including sewage sludges, waste chemicals, liquid wastes, fermentation wastes, hopper dredge spoils, and fly ash. In addition deposits in the waste disposal areas were sampled. Physical properties determined were bulk density, grain density, and settling velocity. Spectrochemical analysis was used to determine Ag, B, Ba, Co, Cr, Cu, Mn, Ni, Pb, Sn, U, Zn, Si, Ti, Ai, Pe, Mg, Ca, Na, K, and C. Oxidation-reduction potential was also determined. Chemical and physical properties of these wastes suggest that they commonly consist of about 20 percent carbonaceous wastes (possibly sewage solids) mixed with low-carbon river-borne silt (median grain size 30 microns) and an unknown amount of industrial wastes. Ash from coal-fired power generating plants was chemically similar to shale but contained appreciable amounts of mullite. Some samples of waste chemicals had high concentrations of such metals as Pb, Sn, and Zn. A preliminary budget of waste solids dumped in the New York Bight indicates shat dredged wastes are a major source of oxygendemanding substances and potentially troublesome metals. Certain metals, especially Ag and Pb, and the high carbon concentrations are promising as tracers in delineating distributions and subsequent movement of waste deposits in the region. (Little-Battelle)

SALMONELLAE AND EDWARDSIELLA
TARDA IN GULL FECES: A SOURCE OF CONTAMINATION IN FISH PROCESSING PLANTS,
Oregon State Univ., Corvallis. Dept. of
Microbiology.
For primary bibliographic entry see Field 05B.
W73-10463

THE APPLICATION OF MULTI-ATTRIBUTE SCALING PROCEDURES TO THE DEVELOPMENT OF INDICES OF VALUE, Michigan Univ., Ann Arbor. Engineering Psychology Lab. M. F. O'Connor.

Available from the National Technical Information Service as AD-746 155, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No 037230-1-T, June 1, 1972. 152 p, 23 fig, 16 tab, 3 append. Project No. NR 197-014. Contract No. N00014-67-A-0181-0034.

Descriptors: *Water quality, *Mathematical models, Phenols, Dissolved oxygen, Dissolved solids, Hydrogen ion concentration, Fluorides, Hardness (Water), Nitrates, Chlorides, Alkalinity, Turbidity, Color, Sulfates, Temperature, Ammonia, Phosphates, Mathematical studies, Coliforms.

Identifiers: *Water quality index, *Data interpretation, Fecal coliforms.

Multi-attribute scaling procedures were used to develop water quality indices for waters to be used for human consumption and for support of fish and wildlife. Scaling procedures were applied to this task by assessing, from water quality engineers, (1) judgements about which variables should be included in the index, (2) the type of rule for combining the variables, (3) the relative importance weights of the different variables, and (4) a curve describing the functional relation between water quality and each variable. A modified Delphi procedure was used for obtaining concensus among the engineers for each of the indices. Even after the applications of the Delphi procedure, the engineers disagreed on the importance weights, so a sensitivity analysis applied the different indices to actual measurements on samples of river water. This analysis indicated that the disagreement about the weights was not crucial to the measurement of water quality. The parameters considered as indicators of water quality were: fecal coliforms, phenols, DO, dissolved solids, pH,

fluorides, Hardness, nitrates, chlorides, alkalinity, turbidity, color, sulfates, temperature, ammonia, and phosphates. An additive equation was used to combine the chosen parameters into a water quality index. (Little-Battelle)

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OIL/WATER INTERFACE DETECTOR, Esso Research and Engineering Co., Florham Park, N.J.

J. O. Moreau.

Available from the National Technical Information Service as COM-72-11295, \$3.00 in paper copy, \$0.95 in microfiche. Final Report No. EE.4TMR.72, December 1971. 99 p, 7 ref, 3 append. Project No. Task II, Sub-Task I. Contract No. C-1-35049.

Descriptors: *Oil-water interfaces, *Oily water, *Electrical equipment, Pollutant identification, Costs, Oil, Oil pollution, Water pollution sources, On-site investigations, Monitoring, Electronic equipment. *Detectors, *Detection limits, On board analysis. Sensors.

A survey of manufacturers was conducted to find all equipment that could differentiate between oil and water on a continuous basis and thus be used as an oil-water interface detector during tanker deballasting. Twenty-five possibly applicable devices were found. Based on manufacturers' information, these devices were evaluated in relation to shipboard conditions such as installation, safety, maintenance, and operation requirements. The device which seems best suited to ballast control applications is the Sensall 440 Series In-Line Interface Sensor which measures sonic attenuation. The Sensall would have a probe detector mounted in the discharge line and would alarm at oil concentrations well below 1 percent. Laboratory and shipboard tests would be recommended for installation aboard ship. The NUS sonic interface detector and the Gallbrith Oil Overboard Discharge Alarm system will also merit further study if they can be modified to meet shipboard safety restrictions. (Little-Battelle)

MULTI-SENSOR DETECTION AND TRACKING OF CONTROLLED OIL SPILLS, Spectran, Inc., Hollywood, Calif. Microwave Sensor Systems Div. For primary bibliographic entry see Field 05B. W73-10467

EFFECT OF ION PAIRING ON THE PH OF SEAWATER, Rhode Island Univ., Kingston. Graduate School of Oceanography. For primary bibliographic entry see Field 02K. W73-10469

A NEW SPECIES OF PSEUDOCODIUM (CHLOROPHYTA, SIPHONALES) FROM THE WEST COAST OF FLORIDA, University of South Florida, Tampa. Dept. of Biology.
C. J. Dawes, and A. C. Mathieson.
Phycologia, Vol. 11, Nos. 3/4, p 273-277, December 1972. 6 fig, 1 tab, 8 ref.

Descriptors: *Systematics, *X-ray diffraction, Distribution, *Florida, Pollutant identification, *Chlorophyta, Marine algae. Identifiers: *Pseudocodium floridanum.

A new species of Pseudocodium (P. floridanum) is described from deep waters (37 to 55m) off the west coast of Florida. It is the third described species of Pseudocodium, and the first record of the genus from the northern hemisphere. X-ray dif-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

fraction studies indicate the presence of Beta, 1-4 mannan in its cell walls. The affinities of Pseudocodium are discussed. (Little-Battelle)

PRELIMINARY ANALYSES OF URBAN WASTES, NEW YORK METROPOLITAN RE-

State Univ. of New York, Stony Brook. Marine Sciences Research Center. G. M. Gross.

G. M. Gross. Available from the National Technical Informa-tion Service as AD-746 959, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No. 5, February 6, 1970. 32 p, 5 fig, 9 tab, 8 ref. Grant No. DACW 72-70-C-0009.

Descriptors: "Sewage sludge, Pollutant identifica-tion, Methodology, "Alkali metals, "Alkaline earth metals, "Heavy metals, Industrial wastes, Chemi-cal analysis, Soil analysis, Sedimentary rocks, Sampling, Sewage treatment, Chromium, Copper, Zinc, Pollutants, New York, Iron, Aluminum, Cal-cium, Magnesium, Boron, Phosphorus, Titanium, Lead, Manganese, Nickel, Molybdenum, Cadmi-um, Sodium, Cobalt, Potassium, Strontium, Mer-cury, Beryllium, Carbon, Sulfides. Identifiers: "Rare earth elements, "Optical emis-

cury, Beryllium, Carbon, Sulfides. Identifiers: "Rare earth elements, "Optical emission spectroscopy, Aluminosilicates, Chemical recovery, Sample storage, Sample preservation, Accuracy, Precision, Reproducibility, Loss-on-ignition procedure, Wet combustion procedure, Sample preparation, "New York Bight, Tin, Silver, Spectrochemical analysis, Carcinogens, Silicon, Barium, Bismuth, Vanadium, Zirconium, Arsenic, Antimony, Thallium, Gallium, Yttrium, Ytterbium, Cerium.

Preliminary analyses were made of 17 sewage sludge samples from sewage treatment plants serving 11.9 million persons in the New York Metropolitan Region. The sludges consist of about 55 percent organic matter, which, in turn, accounts for about 55 percent of the total oxygen demand of the sludges. About 45 percent of the sludge consists of aluminosilicate material, chemically similar to shale. The samples are enriched, compared to sedimentary rocks and soils, in the following elements: silver (150x), chromium (10x), copper (50x), tin (30x), and zinc (30x). All of these elements are common industrial materials, and are Preliminary analyses were made of 17 sewage elements are common industrial materials, and are known to be highly toxic to marine organisms; some are carcinogenic. Further studies are required to determine the chemical form in which required to determine the chemical form in which they occur in the sludges and whether they are released to organisms or to seawater after dump-ing or deposition of the sludges. These preliminary analyses indicate the semi-quantitative spec-trochemical analyses may be useful for determin-ing order-of-meanity-to-constitute. ing order-of-magnitude concentrations of at least 24 elements commonly converted to the commonly converted to the commonly converted to the co mg order-ot-magnitude concentrations of at least 24 elements commonly occurring in sewage studges. Other techniques are required to detect other possible pollutants, with usable precision. Loss on ignition is a useful technique to use in analysis of organic matter (Volatile matter) in sewage sludges not containing large amounts of hydrous aluminosilicates. (Holoman-Battelle) W73-10471

GAS-LIQUID-SOLID CHROMATOGRAPHY OF

FREE ACIDS, Rome Univ. (Italy). Istituto di Chimica Analitica. A. Di Corcia. Analytical Chemistry, Vol. 45, No. 3, p 492-496, March 1973. 6 fig, 1 tab, 19 ref.

Descriptors: *Organic acids, *Chemical analysis,

*Pollutant identification, *Separation techniques, *Molecular structure, Selectivity, Efficiencies, Chemical properties, Aromatic compounds, Organic compounds.

Chemical properties, Atomate Compounds, or ganic compounds. Identifiers: *Gas-liquid-solid chromatography, Detection limits, Gas liquid chromatography, Chromatographic columns, 2-Methylbutyric acid, Fatty acids, 3-Methylbutyric acid, Acetic acid,

acid, m-Hydroxybenzoic acid, p-Hydroxybenzoic acid, o-Nitrobenzoic acid, Isovaleric acid, Elaidic acid.

The use of gas-liquid-solid chromatography has been extended to the elution of free acids. The been extended to the chuton of free acids. The coating of the graphitized carbon black, such as graphitized Sterling FT (FT-G), by means of a suitable amount of an involatile stationary phase (FFAP) makes possible the linear clution of free acids at the aanogram level. By varying the injuid/solid ratio, gas-liquid-solid (GLS) columns have been evaluated in terms of selectivity, efficiency, and time of elution for acid compounds. se bases, GLS columns have been com pared with a GL column normally used for the analysis of acids. The results confirm that the surface of the carbon is very effective in separating molecules differing mainly in their geometric structure. In addition, GLS columns retain peak broadening also at high linear carrier gas veloci-ties. On FT-G coated with 0.3 percent FFAP, the separation of C2-C5 fatty acids, including 2-methylbutyric and 3-methylbutyric acids, in a very dilute water solution (approximately 40 ppm) has been obtained in about 1.5 minutes. The separation of the isomers of some aromatic acids also has been performed. (Holoman-Battelle) W73-10473

DETERMINATION OF AMMONIACAL NITROGEN IN THE PRESENCE OF UREA WITH AN AMMONIA ELECTRODE, AMMONIACAL

essee Valley Authority, Muscle Shoals, Ala. Div. of Chemical Development. T. C. Woodis, Jr., and J. M. Cummings, Jr.

Journal of the Association of Official Analytical Chemists, Vol. 56, No. 2, p 373-374, March 1973. 3 tab, 3 ref.

Descriptors: *Ureas, *Nitrogen, *Ammonia, Methodology, Chemical analysis, Reliability. *Ammonia electrode, Ion selective electrodes, Ammonium, Accuracy, Reduced pressure distillation, Urea ammonium phosphate, Urea ammonium nitrate, Urea ammonium polyphosphate, Urea ammonium sulfate, Chemi-

A recently introduced commercial electrode is shown to be suitable for the determination of amniacal nitrogen in the presence of urea. The results compare favorably with those of the reduced pressure distillation method. Standard deviations for the electrode method and the reduced pressure distillation method for ammonia cal nitrogen in urea ammonium phosphate are 0.12 and 0.09 percent, respectively. (Holoman-Battelle) W73-10474

AN ANALYSIS OF FACTORS GOVERNING PRODUCTIVITY IN LAKES AND RESER-

VOIRS, Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology. ary bibliographic entry see Field 05C.

PERSISTENCE OF PARATHION IN SIX CALIFORNIA SOILS UNDER LABORATORY

California University, Riverside, Citrus Research Center and Agricultural Experiment Station. For primary bibliographic entry see Field 05B.

IRON-PHOSPHATE COMPOUND IDENTIFICA-TION IN SEWAGE SLUDGE RESIDUE, Marquette Univ., Milwaukee, Wis. Coll. of En-M. A. Seitz, R. J. Riedner, S. K. Malhotra, and R.

Environmental Science and Technology, Vol. 7, No. 4, p 354-357, April 1973. 1 fig, 3 tab, 6 ref.

Descriptors: *Pollutant identification, sludge, X-ray analysis, X-ray diffraction, Methodology, Separation techniques, Sewage treatment, X-rays, Pollutants. entifiers: *Vivianite, *X-ray powder diffraction,

The iron phosphate compound, vivianite (Fe3 (Po4)2.8H20), has been identified by use of Z-ray powder diffraction techniques, as existing in the dried secondary sludge residue of the Milwaukee Jones Island sewage treatment plant. In identifying this compound, various methods of drying the sludge residue were evaluated. Magnetic separation techniques were used to concentrate and separate vivianite from the bulk of the dried material. Analysis indicated that vivianite existed material. Analysis indicated that vivianite existed in a concentration of about 1 wt percent of the dried material. (Holoman-Battelle) W73-10478

DIRECT TITRIMETRIC MICRODETERMINA-TION OF FLUORODIFEN, LINURON, FANERON, AND PEBULATE, Allahabad Agricultural Inst. (India). Dept. of

S. L. Abbas, A. K. Ghosh, S. A. I. Rizvi, and O. C.

Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 387-389, March 1973. 1

Descriptors: "Herbicides, "Volumetric analysis, Pollutant identification, "Soil analysis, Chemical analysis, Dyes, Soil contamination, Methodology, Chemical reactions, Urea pesticides, Halogenated

Chemical reactions, Urea pesticides, Halogenated pesticides. Identifiers: *Fluorodifen, *Linuron, *Faneron, *Pebulate, Chemical indicators, Chemical recovery, Bromocresol green, Catechol violet, Xylenol orange, Organic dyes, Gallium chloride, Metal complexes, Complexation, Phenylurea pesticides.

The herbicides fluorodifen, linuron, faneron, and pebulate have been determined in individual standard solutions by direct titration against gallium chloride solution, using different indicators. The same technique was applied to estimation of these herbicides in treated soils. The complex between gallium chloride and fluorodifen or linuron was formed in a 1:3 ratio, whereas the complex with formed in a 1:3 ratio, whereas the complex with faneron or pebulate was in a 1:1 ratio. Recoveries for fluorodifen, linuron, faneron, and pebulate were 99.9-101.5, 99.0-102.4, 97.1-101.3, and 98.3-101.2 percent, respectively. Treatment with herbicide lowered the pH of the soil. (Holoman-Bat-W73-10481

DRY ASHING TECHNIQUE FOR THE DETER-MINATION OF ARSENIC IN MARINE FISH, Beak (T.W.) Consultants, Ltd., Toronto (Ontario).

Lab. Div. P. J. Leblanch, and A. L. Jackson

Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 383-386, March 1973. 6 tab, 19 ref.

Descriptors: *Colorimetry, *Marine fish, *Pollutant identification, Methodology. Identifiers: *Arsenic, *Dry ashing, Sample preparation, Silver diethyldithiocarbamate, nical recovery, Precision, Detection limits.

Group 5A-Identification of Pollutants

A dry ashing procedure, followed by the silver diethyldithiocarbamate colorimetric determination of arsenic in marine fish, is presented. The sample was first homogenized and a portion pre-ashed with magnesium nitrate, using infrared heat, followed by ashing in a 500 C muffle furnace. The residue was dissolved in HCl and the arsenic reduced by means of zinc and HCl to arsine, which was complexed with AgDDC and detered colorimetrically at 535 nm. At temperatures mined colorimetrically at 533 nm. At temperatures of 460 C and above, efficient ashing was obtained. The effect of various volumes of ashing aid (50 percent magnesium nitrate) was also studied. Maximum recovery and precision were obtained when a minimum of 8 ml 50 percent magnesium nitrate was used. Standard recoveries of inorganic arse added to NBS orchard leaves and a sample of dry added to NBS orchard leaves and a sample of dry marine fish tissue gave values of 91-98 percent. Analyses of a number of standard NBS orchard leaves and marine fish As-1 and As-2 gave coefficients of variation of 7.0, 6.0, and 8.1 percent, respectively. Results from dry ashing and wet digestion of a number of species of marine fish were not comparable. Levels of arsenic found in different species of marine found in different species of marine fish ranged from less than 0.4 to 27.0 micrograms As/g wet weight. Crabs were found to contain elevated amounts of arsenic. (Holoman-Battelle)

RAPID, SENSITIVE METHOD FOR DETER-MINATION OF MERCURY IN A VARIETY OF BIOLOGICAL SAMPLES, North Dakota State Univ. Fargo. Dept. of Animal

F. D. Deitz, J. L. Sell, and D. Bristol. Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 378-382, March 1973. 4 fig. 2 tab. 6 ref.

Descriptors: *Mercury, *Pollutant identification, *Chemical analysis, Milk, Soil analysis, Alfalfa,

*Chemical analysis, Milk, Sou analysis, Affaira, Heavy metals, Temperature. Identifiers: *Biological samples, *Flameless atomic absorption spectrophotometry, Accuracy, Sample preparation, Meat, Precision, Detection limits, Wet digestion, Sensitivity.

A simple, rapid method is described for the routine determination of mercury at levels as low as 2 ng (2 ppb) in a wide variety of biological samples. Vanadium pentoxide-catalyzed wet digestion at 140 C was used for complete oxidation of organic tissue. Mercury was determined by flameless atomic absorption spectrophotometry, utilizing a syringe technique to transfer mercury-containing vapor to the absorption cell. Replicate analyses of vapor to the absorption cell. Replicate analyses of samples on different days showed good precision and accuracy. Coefficients of variations for deter-minations within a days run ranged from 2 to 17 percent at mercury concentrations of 30 to 40 ppb. Results agreed very closely with those obtained by neutron activation analyses of the same samples. On a routine basis, 2 analysts can analyze 30-40 samples/day. (Holoman-Battelle) W73-10483

A QUANTITATIVE PUSH-NET SYSTEM FOR NSECT STUDIES OF LARVAL FISH AND MACROZOOPLANKTON, Hawaii Inst. of Marine Biology, Honolulu For primary bibliographic entry see Field 07B. W73-10485

CONTAMINATION OF SURFACES BY BAC-TERIAL NEUSTON. California Univ., Berkeley. Naval Biomedical Research Lab.

L. H. Disalvo.

Limnology and Oceanography, Vol 18, No 1, p 165-168, January 1973. 2 tab, 10 ref. N00014-69-A-

Descriptors: "Air-water interfaces, "Sampling, Fouling, Marine bacteria, Sea water, Cultures, Water pollution effects, Aggregates, Organic matter, Population.
Identifiers: "Viable counts, "Neuston.

Primary bacterial fouling of glass both underwater and at the air-sea surface was investigated. A sam-pler called the MT or mousetrap device was con-structed for the investigations. This device basi-cally consisted of a plexiglass case fitted with doors which could be actuated by the springs and bars of a 9 by 18 cm rattrap. The sampling surf were marbles mounted on the stainless steel is were marbles mounted on the stainless steel inside the case. When the sampler was lowered into the water, the doors were opened by shifting the sam-pler weight to a door control line. After a specified period of time, the doors were closed, the sampler retrieved and the marbles removed and treated to remove fouling organisms for counting. In two replicate experiments, bacteria were counted from: (a) marbles lowered and raised through the replicate experiments, discretial were counter from: (a) marbles lowered and raised through the air-sea interface, (b) marbles lowered through the interface but protected by the MT device, (c) water samples obtained at the air-sea interface, and (d) water samples obtained beneath the surface. Interface water samples were collected with sterile stainless steel screens 25 sq cm, having 1-mm openings and a wire thickness of 0.4 mm. Interfacial water samples contained about one order of magnitude higher viable counts than subsurface waters, and marbles contacting the air-sea interfaces retained almost three order of magnitude more bacteria then protected marbles. There were daily flucturations in bacteria retained. The measurements show that rapid irreversible sorption of over 1000 bacteria/cm occurred within 1-2 minutes surements show that rapid irreversible sorption of over 1000 bacteria/cm occurred within 1-2 minutes of immersion in natural waters typically containing 1000-100,000 colonies/ml. It is suggested that the rapidity of this attachment could air in the linkage of particles near the sea surface and act as a mechanism for the formation of organic aggregates. (Little-Battelle)

THE VALIDITY OF THE APPLICATION OF SIMPLE KINETIC ANALYSIS TO HETEROGENEOUS MICROBIAL POPULA-TIONS, Southampton Univ. (England). Dept. of Oceanog-For primary bibliographic entry see Field 05C. W73-10489

ADSURPTION OF CHLORINATED HYDROCARBONS FROM SEAWATER BY A CROSSLINKED POLYMER, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05B. W73-10490

DEVELOPMENT OF AN OIL/WATER POLLU-TION MONITOR, Naval Postgraduate School, Monterey. Calif. F. K. McGrath.

Available from the National Technical Informa-tion Service as AD-747 084, \$3.00 in paper copy, \$0.95 in microfiche. Master's Thesis, June 1972. 35 p, 11 fig, 10 ref.

Descriptors: *Oily water, *Monitoring, *Electronic equipment, *Ultrasonics, Water analysis. Identifiers: *Fuel oil, Bilge water, Ballast water.

Because of the simplicity, ruggedness, and state of the art, ultrasonic techniques were chosen for monitoring oil in bilge and ballast water from ships. Crystalline quartz was used to produce ul-trasonic waves at 30 Mhz which were monitored for attrastrice using another must crustal. The for attenuation using another quartz crystal. The system was tested in the laboratory with a tank designed to circulate contaminated water past the monitor. Calibrations were made with distilled water before testing with water containing up to

500 ppm fuel oil. Results with contaminated tap water were inconclusive, but attenuation was found to vary linearly with oil concentration when the contaminant level was less than 500 ppm in distilled water. Turbulence disturbed the signals, but could probably be eliminated by filtering. Although results are preliminary, the method is potentially useful for monitoring relatively low levels of oil in water. (Little-Battelle)

REVERSE PHASE THIN LAYER CHRO-REVERSE PHASE THIN LAYER CHRO-MATOGRAPHY OF SOME AROCLORS, HALOWAXES, AND PESTICIDES, Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab. D. L. Stalling, and J. N. Huckins. Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 367-372, March 1973. 6 fig, 3 tab, 7 ref. Two
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Descriptors: "Polychlorinated biphenyls, "Pollutant identification, "Chlorinated hydrocarbon pesticides, "Pesticide residues, Chemical analysis, Separation techniques, Aldrin, Dieldrin.

Identifiers: "Thin layer chromatography (Reverse phase), "Chlorinated naphthalenes, Aroclor 1234, Aroclor 1248, Aroclor 1248, Aroclor 1248, Aroclor 1248, Aroclor 1250, Halowax 1099, Holowax 1013, Halowax 1014, Solvent extraction systems, GLC-Mass spectrometry, Gas liquid chromatography, p p' DDT, p p' DDE, Chlordane, Isomers, Precision, Reproducibility, Sensitivity, Carassius auratus, Goldfish, Electron capture gas chromatography.

Electron capture gas chromatography.

The components of Aroclors 1232, 1248, 1254, and 1260; Halowaxes 1099, 1013, and 1014; and several chlorinated pesticides were resolved by reverse phase thin layer chromatography (RPTLC), which permits component separation by partition between a nonpolar stationary phase and a polar mobile phase. R sub f values of resulting spots were calculated for 2 of 4 new solvent systems (mobile phases). RPTLC patterns were reproducible and characteristic of each material examined. The spots were recovered from the plates and characterized by gas-liquid chromatography (GLC) and/or GLC-mass spectrometry. In some cases, single GLC peaks of Aroclor standards were resolved into a more component by RPTLC, whereas some RPTLC spots of Halowaxes were resolved into a many as 4 GLC peaks. The analysis of environmental residues of chlorinated compounds was facilitated by this technique. (Holoman-Battelle)

COMPARATIVE STUDIES OF THIN LAYER CHROMATOGRAPHIC SYSTEMS FOR THE SEPARATION AND IDENTIFICATION OF PHOTOALTERATION PRODUCTS OF

Mississippi Agricultural and Forestry Experiment Station, State College. R. L. Joiner, and K. P. Baetcke. Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 338-340, March 1973. 3 tab, 27 ref.

Descriptors: "Separation techniques, "Pollutant identification, Methodology, Organophosphorus pesticides, Chemical analysis, Phenolic pesticides, Insecticides, Phosphothioate pesticides, Solvent

extractions.

Identifiers: Parathion, "Thin layer chromatography, "Photodecomposition, "Degradation products, Sample preparation, Infrared spectra, Infrared spectroscopy, Paraoxon, Organic solvents, Solvent extraction systems, Petroleum ether, Ethyl ether, Glacial acetic acid, Methanol, Chloroform, Ammonium hydroxide, O S-diethyl O-p-nitrophenyl phosphate, O O-diethyl S-p-nitrophenyl phosphate, O-ethyl O-O-bis (p-nitrophenyl) phosphorothioate, ethyl bis (p-nitrophenyl) phosphate, O O-diethyl O-phenyl

phosphororthioate, Diethyl phenyl phosphate, p-Nitrophenol, pAminophenol, Diethyl phosphate, Ethyl phosphate.

Twelve thin layer chromatographic systems were compared for the separation of photoalteration products of parathion. R sub f values for each component in each system are presented. Infrared spectra confirmed the identity of separated components. The following 4 systems were designated superior and gave excellent separation of the components: petroleum ether-ethyl ether-glacial acetic acid (80 plus 15 plus 5 and 50 plus 45 plus 5), methanol-chloroform-ammonium hydroxide (24 plus 75 plus 3.5), and methanol-chloroform-petroleum ether (10 plus 20 plus 70). (Holoman-Battelle)

GAS CHROMATOGRAPHIC DETERMINATION OF ETHYLENE THIOUREA RESIDUES, Rohm and Haas Co., Bristol, Pa. Bristol Research

L. D. Haines, and L. L. Adler.

L. D. Haines, and L. L. Adier. Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 333-337, March 1973. 2 fig. 1 tab. 8 ref.

Descriptors: "Pesticide residues, "Chemical analysis, "Pollutant identification, Thiocarbamate pesticides, Fungicides, Methodology, Gas chromatography, Solvent extractions, Carbamate pesticides. Identifiers: "Flame photometric gas chromatography, "Ethylene thiourea, Sample preparation, Column chromatography, Sensitivity, Chemical recovery, Methanol, Metabolites, Organic solvents, Specificity.

Residues of ethylene thiourea on food crops were restaues of ethylene thourse on food crops were determined by extracting the sample with methanol, partially purifying the extract on an alumina column, and derivatizing the ethylene thiournea extracted with 1-bromobutane in the presence of dimethylformamide and sodium borohydride. a unnethyltormamide and sodium borohydride. The resulting derivative was measured by gas-chromatography, using a flame photometric detector. The method is suitable for routine use and is sensitive to 0.01 ppm. (Holoman-Battelle) W73-10494

RESIDUES OF MS-222 IN NORTHERN PIKE, MUSKELLUNGE, AND WALLEYE, Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab. J. L. Allen, C. W. Luhning, and P. D. Harman. Allen, C. W. Luhning, and P. D. Harman. stigations in Fish Control Report No 45, July 1972 8 n 3 tab 6 ref

Descriptors: *Walleye, *Colorimetry, Pollutant indentification, Freshwater fish, Pikes, Temperature, Chemical analysis.
Identifiers: *MS-222, *Northern pike, *Muskellunge, *Muscle, *Thin layer chromatography, Drugs, Esox masquinongy, Esox lucius, Stizostedion vitreum, Anesthetics, Tricane methanesulfonate, Detection limits.

Residues of MS-222 in muscle of northern pike, muskellunge, and walleye following anesthesia at selected temperatures were measured by the modified Bratton-Marshall colorimetric method (Walker and Schoettger, 1967b) and confirmed by (Walker and Schoettger, 1967b) and confirmed by thin-layer chromatography (Allen, Luhning, and Harman, 1970). The mean concentration of MS-222 residues at the 0-hour withdrawal interval ranged from 2.4 to 19.5 ppm. The level of MS-222 residues at 0-hour withdrawal was highest in northern pike and lowest in walleye. After 24 hours withdrawal from the anesthetic, residues were detected in only 2 of the 12 northern analyzed by thin-layer chromatography, and these two samples were shown to contain less than 2.0 ppm. (Holoman-Battelle) W73-10496 ANALYSIS OF SOLUBLE BERYLLIUM BY GAS CHROMATOGRAPHY, Aerospace Medical Research Lab., Wright-Patter-son AFB, Ohio.

Activation of the Arnold Available from the National Technical Information Service as AD-753 112, \$3.00 in paper copy, \$0.95 in microfiche. Final Report No. AMRL-TR-71-117, August 1972. 36 p, 3 fig. 13 tab, 8 ref. Project No. 6302. Contract Nos. F33615-71-C-1008, F33615-69-C-1062.

Descriptors: "Beryllium, Aqueous solutions, Calibrations, "Gas chromatography, Radioactivity techniques, Separation techniques, Chelation. Identifiers: "Biological samples, "Tissue, "Blood, Electron capture gas chromatography, Detection limits, Sample preparation, Chromatograms, Recovery, Rats, Liver, Spleen.

A new microanalytical method for the detection and quantitation of beryllium in aqueous samples and biological specimens has been developed. The method, based upon quantitation of chelated beryllium by gas chromatography, was employed to detect beryllium in both in vitro samples and tissues of rats given beryllium by injection. Beryllium was administered in the form of aqueous solutions of beryllium sulfate, and as litte as 10 nanocease beryllium sulfate, and as litte as 10 nanocease beryllium sulfate, and as litte as 10 nanocease beryllium sulfate, of subola blood with the sulfate of tions of beryllium sulfate, and as litte as 10 nano-grams beryllium per gram of whole blood were de-tected and quantitated. In vivo studies which com-pared gas chromatographic analyses with radiometric analyses confirmed the validity of the new microanalytical technique. Preliminary stu-dies were conducted to determine the ability of fluorinated chelating agents to remove beryllium oxide from the lungs of rats. (Little-Battelle)

A STUDY OF THE EFFECT OF PH ON THE DETERMINATION OF ZINC BY ATOMIC AB-SORPTION SPECTROPHOTOMETRY.

Geological Survey, Sacramento, Calif.
A. E. Dong.
Applied Spectroscopy, Vol 27, No 2, p 124-128,
March/April 1973. 2 fig. 9 tab, 14 ref.

Descriptors: *Water analysis, *Zinc, *Hydrogen ion concentration, Potassium, Manganese, Spectrophotometry, Groundwater, Absorption, Elements (Chemical). Identifiers: *Errors, *Atomic absorption spectrophotometry, Lithium, Chemical interference.

Errors in zinc determinations in natural water by atomic absorption spectrophotometry have been found to result from variations in pH. Consequently, a study was conducted to determine the effect of pH on the analysis of zinc. Comparative analyses were also run on lithium, potassium, and manganese. Foreign species, phosphates and silicates, were added to some of the zinc solutions to study possible chemical interferences. Results showed that lithium, potassium, and manganese absorptions were essentially unaffected by pH changes. However, results with zinc showed that zinc absorption is constant in the pH range of about 2 to 5. Between pH 5 and 10, a sharp decrease in absorption is observed. With an increase above pH 10, zinc absorption levels off to a constant value. Experimental data suggested that pH variation rather than chemical interferences is primarily responsible for the variation of absorption in zinc analysis. Several possibilities, such as sorption of zinc to container walls, zinc hydroxide formation in flame subsequently attacked by hydrogen atoms, have been considered in aed using a 45 percent phenol extraction procedure, was found to contain lipid A fraction to 27 percent of the LPS by weight. In the lipid A fraction, glucosamine was the only amino sugar to be present, and a high molar ratio of phosphate to amino sugar (2.5:1) was noted. Two hydroxy fatty acids, hydroxydodecanoic and hydroxymyristic, were identified among the fatty acids by gas-liquid chromatography. A role of the lipopolysaccharides in Errors in zinc determinations in natural water by

the salt requirement of marine bacteria is suggested (Little-Battelle) W73-10499

ULTRASTRUCTURE OF STAPHYLOCOCCUS EPIDERMIDIS AFTER FREEZE-ETCHING AND THIN SECTIONING,
McGill Univ., Montreal (Quebec). Dept. of

Microbiology.

J. E. Gilchrist, and I. W. DeVoe.

Canadian Journal of Microbiology, Vol 19, No 2, p
294-295, February 1973. 6 fig, 12 ref.

Descriptors: *Pollutant identification. Separation techniques, *Electron microscopy.

Identifiers: *Staphylococcus epidermidis, *Ultrastructure, Freeze etching, Thin sectioning.

Staphylococcus epidermidis was isolated from a gradient plate and freeze etched for examination of ultrastructure. Typical of Staphylococcus, the cell walls consisted of three layers: a dense outer layer, a rather electron translucent middle layer, layer, a rather electron translucent middle layer, and a very dense layer next to the cytoplasmic membrane. Numerous mesosomes of both the vesticular and laminar types were evident in thin sections. Single vesicular structures that appeared to be invaginations of the trilaminar cytoplasmic membrane were also observed. (Little-Battelle) W73-10500

STUDIES OF THE CELL ENVELOPE OF VIBRIO PARAHAEMOLYTICUS, Georgetown Univ., Washington, D.C. Dept. of Biology.

Biology.
C. F. Deneke, and R. R. Colwell.
Canadian Journal Microbiology, Vol 19, No 2, p
241-245, February 1973. 4 fig, 1 tab, 29 ref.

Descriptors: "Separation techniques, "Marine bacteria, "Pollutant identification, Pathogenic bac-teria, Gas chromatography, Poods, Cultures. Identifiers: "Gas liquid chromatography, "Vibrio parahaemolyticus, "Fatty acids, Seafoods.

Components of the cell envelope of Vibro parahaemolyticus were investigated. Vibrio parahaemolyticus is an estuarine microorganism associated with diseases of marine and estuarine animals and seafood-borne enteritis in man. Puammans and searcoct-torne entertus in main. ru-rified lipopolysaccharide (LPS), isolated using a 45 percent phenol extraction procedure, was found to contain lipid A fraction to 27 percent of the LPS contain lipid A fraction to 27 percent of the LPS by weight. In the lipid A fraction, glucosamine was the only amino sugar to be present, and a high molar ratio of phosphate to amino sugar (2.5:1) was noted. Two hydroxy fatty acids, hydroxydodecanoic and hydroxymyristic, were identified among the fatty acids by gas-liquid chromatog-raphy. A role of the lipopolysaccharides in the salt requirement of marine bacteria is suggested. (Lit-tle-Batelle) W73.10501 W73-10501

SIMPLIFIED GAS CHROMATOGRAPHIC PROCEDURE FOR IDENTIFICATION OF BAC-TERIAL METABOLIC PRODUCTS, Umea Univ., (Sweden). Dept. of Oral Microbiolo-

I. Carlsson.

Applied Microbiology, Vol 25, No 2, p 287-289, February 1973. 3 fig, 3 ref.

Descriptors: *Anaerobic bacteria, *Separation techniques, "Gas chromatography, Cultures, Methodology, Coliforms, Enteric bacteria, Pollu-tant identification.

Identifiers: *Patty acids, Lactic acid, Pyruvic acid, Succinic acid, Sample preparation, Lac-tobacillus acidophilus, Bifidobacterium eriksonii, Eubacterium limosum, Chromatograms, Olucose

Group 5A—Identification of Pollutants

A rapid and simple procedure is described for analysis of fermentation products from anserobic bacteria grown in glucose broth. A 1-ml sample of the culture is drained through cation-exchange resin in a Pasteur pipette. The effluent fluid is directly analyzed isothermally in a gas chromatograph for volatile fatty acids (C2 to C6) as well as for lactic, pyruvic, and succinic acids. This procedure is considered to be suitable for routine use in clinical bacteriology. (Little-Battelle) W73-10502.

STRUCTURE ACTIVITY CORRELATIONS OF BIODEGRADABILITY OF DDT ANALOGS, Illinois Univ., Urbana. Dept. of Entomology. For primary bibliographic entry see Field 63B. W73-10504

THE P-VALUE APPROACH TO QUANTITATIVE LIQUID-LIQUID EXTRACTION OF PESTICIDES AND HERBICIDES FROM WATER. 2. SELECTION OF WATER: SOLVENT RATIOS AND NUMBER OF EXTRACTIONS

Drexel Univ., Philadelphia, Pa. Environmenta Studies Inst.

Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 288-294, March/April 1973. 1 fig. 6 tab, 26 ref. EPA Project 16020FYT. Grant No 801179.

Descriptors: Water, *Solvent extractions, *2 4-D, tion techniques, Herbicides, Computer proms, Solvents.

grams, Soveens.

(Chemical recovery, Sample preparation, Liquid-liquid extraction, Benzene, Hexane, Ethyl ether, Ethyl acetate, Chloroform.

Equations are developed from liquid-liquid extraction theory for the number of extractions and water: solvent ratios for maximum recovery for typical p-values (P-value is defined as the fraction typical p-values (r-value is derined as the rraction of the total solute that distributes itself in the non-polar phase of an equivolume solvent pair). A computer program analysis of the equations developed indicates that a pesticide which has a p-value greater than or equal to 0.90 in an aqueous solvent system can be extracted from the aqueous phase with 95 percent recovery in no more than 5 successive extractions of at least 50 ml with a total volume of more than 500 ml of solvent. The equations were successfully tested with serial extraction of 2, 4-D by separatory funnel and vortex stirring extraction procedures. The contribution to the total error of initial LLE step was estimated to be less than 20 percent for a four-step serial extraction. (Little-Battelle) W73-10505

HYDROLYSIS OF AQUEOUS SOLUTIONS OF SODIUM 2,2-DICHLOROPROPIONATE UNDER SELF-INDUCED ALKALINE CONDITIONS, Agricultural Research Service, Fargo, N. Dak. Metabolism Lab. For primary bibliographic entry see Field 05B.

ADJUED LEMENT ANALYSIS BY PROTON-I-NDUCED X-RAY EXCITATION, Maryland Univ., College Park. F. C. Young, M. L. Roush, and P. G. Berman. International Journal of Applied Radiation and Isotopes, Vol 24, No 3, p 153-163, March 1973. 8 fig, 11 ref. TRACE ELEMENT ANALYSIS BY PROTON-I-

Descriptors: "X-ray fluorescence, "Trance elements, "Pollutant identification, X-ray analysis, Chemical analysis, Sediments, Plankton, Enzymes, Air pollution, Perches, Efficiencies, Xrays, Algae.

Identifiers: *Environmental samples, *Biological samples, *Multielemental analysis, Chemical com-

position, Sensitivity, Detection limits, Blood, Liver, Hemoglobin, Lithium-drifted silicon detec-tor, Brain, Swordfish, Hair, Sample preparation.

tor, Brain, Swordfish, Hair, Sample preparation. The potential for the simultaneous analysis of samples for traces of all elements with an atomic number (2) greater than or equal to 15 by x-ray fluorescence using 2.5-MeV protons is described along with the advantages and limitations of the technique. Only miligram quantities of material are required and the sensitivity changes quite slowly and smoothly from element to element in contrast to the method of neutron activation. The technique is nondestructive and a minimum or no work in sample preparation is required. The sample must be thin and reasonably uniform. For maximum sensitivity, the sample must be either self-supporting or mounted on a very thin backing. Samples are generally placed in a high vacuum for irradiation although the potential exists to irradiate samples outside the vacuum by passing the beam through a thin window. This technique has been applied to a variety of environmental and biological materials, including air pollution, sediment, plankto, perch blood and liver enzyme, and hemoglobin. For samples of 0.1 mg/sq cm in thickness, sensitivities as small as 0.1 ppm can be expected. (Holoman-Battelle) w73-10508

TWO INSTRUMENTS FOR ACTIVATION ANALYSIS OF SOLUTIONS BY A DILUTION

Instituut voor Kemphysisch Onderzoek, Amsterdam (Netherlands). dam (Netherlands). For primary bibliographic entry see Field 07B. W73-10509

A RAPID, INEXPENSIVE COULOMETRIC DETERMINATION OF SULPHUR IN PETROLE-UM PRODUCTS, Laporte Industries Ltd., Widnes (England).

J. M. Carter. Analyst, Vol 97, No 1161, p 929-936, December

Descriptors: *Sulfur, *Oil, Laboratory equipment Identifiers: Recovery, *Detection limits, *Samp preparation, Precision, *Coulometric titratio Sensitivity, Oil characterization.

A method has been developed for determining sulfur in oil using a combustion chamber and measuring with a coulometric cell the quantity of sulfur dioxide produced. The coulometer used was a modified Gallenkamp C and H microfurnace. With the setup described, it was possible to determine sulfur in oils in the range of 0.01 to 1.0 percent m/m. The advantages of the method are: Samples can be analyzed in triplicate in 5 minutes; a low degree of operator skill is required to operate the equipment; the method has good precision (coefficient of variation of the mean is 1.4 percent); the method should be usable for determining nitrogen in oil; small samples (0.5 microfitier) are used; and the cost of the set up is low (600 pounds). (Little-Battelle) W73-10510 W73-10510

MODIFICATION OF AN ISCO DRUM FRACTION COLLECTOR TO PERMIT USE OF STOPPERED TEST TUBES, Rockefeller Univ., New York.
M. P. Printz, R. K. Franz, and N. A. Jernberg.
Analytical Biochemistry, Vol 51, No 2, p 482-485, February 1973. 2 fig, 2 ref.

Descriptors: *Chromatography, Laboratory equipment, Design.
Identifiers: *Fraction collector.

An Isco Fraction Collector has been modified to permit use of stoppered test tubes for collection of

column effluents. This unit was developed for and serves a critical function as part of the system used for automated tritium-hydrogen exchange measurements. The primary need for a stoppered test tube fraction collector was (1) to reduce evaporation from 300-microliter column fractions obtained during overnight experiments, and (2) to prevent radioactive cross contamination. However, such a stoppered system should also be valuable for other applications, such as for minimizing evaporation of volatile organic solvents used in either lipid or partition chromatography. (Little-Battelle) W73-10513

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A NEW, SENSITIVE METHOD FOR THE DETERMINATION OF STREPTOMYCIN, Magyar Tudomanyos Akademia, Szeged. Inst. of Biochemistry. E. Duda.

Analytical Biochemistry, Vol 51, No 2, p 651-653, February 1973, 2 fig. 6 ref.

Descriptors: *Antibiotics (Pesticides), *Methodology, *Assay, *Spectrophotometry, *Pollutant identification, *Aqueous solutions, Chemical analysis, Chemical reactions, Biochemistry.

Biochemistry.

Biochemistry.

Streptomycin, Thiobarbituric acid, Absorbance, Reproducibility, Sensitivity, Absorption spectra, N-acetyl glucosamine, Streptidine, 2-deoxy-D-glucose.

deoxy-D-glucose.

In order to avoid the difficulties involved in most chemical methods for the determination of streptomycin, a new assay method based on the periodate-thiobarbituric acid method has been developed. This method uses the observation that the reaction product of streptomycin gives a sharp absorption maximum at 415. This maximum is absent from spectra of other compounds tested including deoxy sugars, streptidine, N-acetyl-glucosamine. A quantity of the streptomycin solution was mixed with potassium metaperiodate in 1 N H2SO4. The mixture was incubated for 15 min at 37 degrees; 2 percent NaAsO2 in 0.5 N HCl was added with shaking; and a 0.3 percent thiobarbituric acid reagent was added after the brownish color disappeared. This mixture was placed in a waterbath for 10 min and the absorbance was measured at 45 mm. The method described gives reproducible results; its sensitivity is equal or better than the sensitivity of other chemical streptomycin assays (the color is stable at least for an hour), and its higher specificity allows its use in cases in which the former methods are not applicable. (Holoman-Battelle) W73-10514

ATOMIC ABSORPTION DETERMINA-THE ATOMIC ABSORPTION DETERMINA-TION OF ZINC WITH A GRAPHITE FURNACE, Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry. D. Clark, R. M. Dagnall, and T. S. West. Analytica Chimica Acta, Vol 63, No 1, p 11-18, January 1973. 4 fig, 3 tab, 5 ref.

Descriptors: "Zinc, "Aqueous solutions, "Pollutant identification, Heavy metals, Chemical analysis, Anions, Cations, Alkali metals, Solvent extractions, Temperature, Silicates, Sulfates, Chlorides, Nitrates, Sodium, Phosphates, Potassium, Copper, Nickel, Aluminum, Cobalt.
Identifiers: "Ionic interference, "Atomic absorption spectrophotometry, "Solvent extraction systems, "Heated graphite furnace, Detection limits, Chemical concentration, Chemical interference, Orangic solventa, Accetates, Barium Tiference, Orangic solventa, Accetates, Accetates, Accetates, Accetates, Accetates, Accetates, Accetates, Accetates, Accetates, Accetat

ference, Organic solvents, Acetates, Barium, Tin, Antimony.

The use of a heated graphite furnace has been evaluated for the atomic absorption determination of zinc. Interference and the use of solvent extraction to overcome such have been investigated. Five-microliter aliquots were applied to different

points along the furnace. The peak height obtained by heating at lower temperatures varied with the sample position, heating at a higher temperature yielded rather constant peak heights. All the ions tested caused interference when present in large amounts. Many of the interferences can be successfully avoided by using most of the solvent extraction for the elimination of interference show that organic solvents cause no problems with the graphite furnace; no surface tension, viscosity, density or enhanced 'nebulizer' effects were noted. The detection limit obtained with aqueous solutions can be lowered by preconcentration in the solvent extraction step, the limiting factor being reagent in solvent blanks. Determinations of rinc were made in the 0.002-1 ppm range. (Holoman-Battelle)

USE OF A BOD OXYGEN PROBE FOR ESTI-MATING PRIMARY PRODUCTIVITY, Wyoming Univ., Laramie. Dept. of Zoology and Physiology.

Limnology and Oceanography, Vol 18, No 1, p 152-154, January 1973. 1 fig, 1 tab, 4 ref.

Descriptors: *Primary productivity, *On-site data collections, *Dissolved oxygen, *Measurement, *On-site tests, Water sampling, Biochemical oxygen demand, On-site investigations, Methodolo-

gy, Instrumentation. Identifiers: "BOD oxygen probe, "Photosynthetic rates, Dissolved organic carbon, Analysis of variance, Data interpretation, Van Dorn sampler, Experimental error, Sample preparation, Accuracy, Winkler method.

Winkler method.

The accuracy of a BOD oxygen probe for field measurements of primary production by the light and dark bottle oxygen technique has been analyzed. Water samples were taken from various depths with a Van Dorn sampler and subsamples placed in light and dark BOD bottles. DO was measured in each bottle before and after a 6-hr in situ incubation. A single water sample was used to measure DOC and to calibrate the oxygen probe. Preparation time at the beginning of each experiment was 1.4 min per bottle, and the time required to measure DOC at the end of each incubation was 0.6 min per bottle. The light bottle change in DOC for seven photosynthesis vs. depth experiments ranged from minus 0.40 to plus 0.90 ppm and the dark bottle change plus 0.05 to minus 0.70 ppm. The ambient DOC was 7-10 ppm. Variability was reduced by pairing the 2 readings from each bottle; a one-way ANOVA was used to estimate experimental error. A figure is presented with which to estimate the number of replicate bottles needed to obtain a given accuracy in estimating photosynthetic rates. The BOD oxygen probe was estimate the number of replicate bottles needed to obtain a given accuracy in estimating photosynthetic rates. The BOD oxygen probe was shown to be a rapid, convenient instrument when used to estimate primary production, and its accu-racy in certain cases may be comparable to that of the Winkler method. (Holoman-Battelle)

ON THE STORAGE OF SEAWATER SAMPLES FOR AMMONIA DETERMINATION, Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.

Limnology and Oceanography, Vol 18, No 1, p 146-150, January 1973. 5 fig, 13 ref.

Descriptors: Storage, *Ammonia, Filtration, *Freezing, *Seawater, Water analysis, Chemical analysis, *California. Identifiers: *Sample preservation, Sample containers, Sample preparation, Glass bottles, Polyethylene bottles, *Monterey Bay (Calif).

In order to clarify conflicting results concerning the effect of storage on ammonia concentration, a

study was initiated to investigate the effects of various storage parameters. Seawater samples were collected from Monterey Bay, California. Portions of the samples were analyzed immediately in shipboard laboratories. The remaining portions were stored in glass or polyethylene containers; filtered or unfiltered; slow frozen or quick frozen and with or without added preservatives. After various periods of time up to 20 days, samples were thawed, analyzed by the phenol-hypochlorite method, and the results compared with those from the unstored samples. The results showed significant changes in samples stored without treatment. Ammonia increased when stored in glass, but decreased when stored in polyethylene containers. Quick freezing and slow freezing stabilized ammonia concentrations; although variability was increased; quick freezing had no advantage over slow freezing. Preservation with reheaf at the second study was initiated to investigate the effects of annough variaousty was increased; quick freezing, had no advantage over slow freezing. Preservation with phenol at the same concentration used in the analytical method (0.4 g 100 per ml) stabilized unfrozen samples for up to 2 weeks. (Little-Battelle) W73-10518

A FIELD FIXATION TECHNIQUE FOR DIS-SOLVED PHOSPHATE IN LAKE WATER, Minnesota Univ., Minneapolis. Limnolog Research Center. For primary bibliographic entry see Field 05C. W73-10519

CHARACTERISTICS OF THE NEARSHORE ENVIRONMENT OFF THE SOUTH COAST OF ANVERS ISLAND, ANTARCTIC PENINSULA, California State Univ., Hayward. Dept. of Earth

D. A. Warnke, J. Richter, and C. H. Oppenheimer. Limnology and Oceanography, Vol 18, No 1, p 131-142, January 1973. 4 fig, 5 tab, 40 ref.

scriptors: *Sediments, Distribution patterns, Descriptors: "Scauments, Descriptors: "Scauments, "Nutrients, "Sea water, "Connate water, "Bacteria, Water quality, Sedimentation, Organic matter, Oxidation-reduction potential, Hydrogen ion concentration, Silica, Water analysis, "Antarcion concentration, Silica, Water analysis, *Antarctic, Nitrites, Nitrates, Cycling nutrients, Sampling, Cultures, Carbon, Silicates, Phosphates, Volumetric analysis, Population, Primary productivity, Chemical analysis.

Identifiers: *Culture media, Agars, Texture.

A study was carried out in Arthur Harbor and vicinity, Antarctic Peninsula, in February and March 1967, to establish the characteristics of bot-March 1967, to establish the characteristics of bottom sediments and the overlying water column, to determine the bacterial numbers in water and sediment samples, to relate these quantitiies to several environmental parameters, and to determine which, if any, of them act as determinants of bacterial distribution. In addition, the possibility of bacterial liberation of nutrients from the surrounding rock outcrops, and their addition to the nearshore nutrient budget, were investigated. The sediments are diamictons and display great lateral variability. Their organic carbon content falls within the range of values for oceanic sediments. Silica concentrations in the interstitial water of these sediments seems to be controlled by Silica concentrations in the interstitial water of these sediments seems to be controlled by biogenic processes of sedimentation. Bacteria are preferentially associated with sediments rich in clay-sized materials and show little or no correlation with organic carbon in these samples; the surface properties of the fine sediment may be important. Bacterial numbers in the water column are similar to those reported for open-ocean areas below 200 m in lower latitudes. Nutrient values are high, but many nitrite values are low relative to nitrate as in lower latitudes before the growth season and in the open ocean below the euphotic zone. These similarities may indicate that primary productivity at the time and place of investigation productivity at the time and place of investigation was low. (Little-Battelle)
W73-10520

THE EXTRACTION OF THE CHROMIUM (III)-THE EXTRACTION OF THE CHROMIUM (III)--EDTA COMPLEX BY SOLUTIONS OF ALIQUAT-336 IN VARIOUS ORGANIC SOL-VENTS, Leeds Univ. (England). Dept. of Inorganic and Structural Chemistry. H. M. N. H. Irving, and R. H. Al-Jarrah. Analytica Chimica Acta, Vol 63, No 1, p 79-84, January 1973. 2 fig, 2 tab, 14 ref.

Descriptors: "Chromium, "Aqueous solutions, Separation techniques, Anion exchange, Trace elements, Methodology, Solvent extractions, Chemical analysis, Chelation, Heavy metals. Identifiers: "Organic solvents, "EDTA, "Metal chelates, "Ion exchange resins, Aliquat-336-Cl, Sample preparation, Amyl alcohol, Chloroform, I 2-Dichloroethane, Hexone, Carbon tetrachloride, Methyl isobutyl ketone, Benzene, Nitrobenzene, p-Xylene, Hexane.

The percentage of chromium (III) extracted as the complex anion CrY (H2O) from solutions containing a 10 percent excess of EDTA (H4Y) by the liquid anion-exchanger Aliquat-336-Cl is shown to increase with change of organic solvent ('diluent') in the order amyl alcohol less than chloroform less than 1,2-dichloroethane less than hexone less than tetrachloride less than benzene less than nitrobenzene less than p-xylere less than hexane. With mixtures of p-xylene and chloroform there is a minimum at 0.4 mole fraction of xylene. The order of solvents can best be correlated with their solubility parameters. With hexane the organic phase separates into two layers of which the one of larger volume (80 percent of total) contains very little extracted ion-pairs. The enhanced concentraittle extracted ion-pairs. The enhanced concentra-tion of chromium (III) in the organic phase of smaller volume can be exploited analytically.

STUDIES IN THE COMPLEX FORMATION OF METAL IONS WITH SUGARS, PART I. THE COMPLEX FORMATION OF COBALT (ID. COMPLEX FORMATION OF COBALT (II), COBALT (III), COPPER (II) AND NICKEL (II) WITH MANNITOL, Oslo Univ. (Norway), Dept. of Chemistry. For primary bibliographic entry see Field 05B. W73-10524

THE DIRECT DETERMINATION OF CHROMI-UM IN URINE BY SELECTIVE VOLATILIZA-TION WITH ATOM RESERVOIR ATOMIC AB-SORPTION.

ital Protection Agency, Perrine, Fla.

Perrine Primate Lab.

R. T. Ross, J. G. Gonzalez, and D. A. Segar.

Analytica Chimica Acta, Vol 63, No 1, p 205-209,

January 1973. 1 fig. 1 tab, 24 ref.

Descriptors: *Trace elements, *Chromium, *Methodology, Chemical analysis, Heavy metals, Pollutant identification.

lentifiers: *Heated graphite atomizer, *Urine, *Atom reservoir atomic absorption spec-trophotometry, Sample preparation, Accuracy, Precision, Biological samples, Detection limits, Chemical digestion, Atomic absorption spec-

Samples of urine were analyzed by the atom reservoir atomic absorption technique for the presence of chromium before and after digestion. The samples were digested by adding 1 ml of nitric acid to 1 ml of urine in teffon vials. The vials were tightly closed to prevent leaks and were placed in an 80 degree oven for 1 and 24 h. After heating, the sameles were couled to come temperature, and the sameles were couled to come temperature, and the 3 degree oven for I and 24 h. Arter neating, the samples were cooled to room temperature, and then 20 microliters were removed by means of an Eppendorf pipette and injected into the heated graphite atomizer. The relative standard deviation for peak signals calculated from twenty injections of 20 microliter aliquots of urine containing 20 ppb of chromium was 2 percent. For aqueous solutions of

Group 5A—Identification of Pollutants

the same concentrations the relative standard deviation was 10 percent. These data are in close agreement with the reproducibilities cited in the literature. The detection limit obtained for chromium was 2.5 ppb for 20-microliter urine samples. Injections of up to 100 microliters are possible with this technique, and such injections could increase the sensitivity of the method. The case of applications are produced to the contract of analysis time of the standard of the standard of analysis time of the standard of tion and shortness of analysis time of this technique promise further applicability toward trace metal analyses in other biological materials. (Holoman-Battelle) W73-10525

DIRECT MEASUREMENT OF LESS THAN 1 PART-PER-BILLION FLUORIDE IN RAIN, FOG, AND AEROSOLS WITH AN ION-SELE-CTIVE ELECTRODE, Naval Research Lab., Washington, D.C.

T. B. Warner, and D. J. Bressan. Analytica Chimica Acta, Vol 63, No 1, p 165-173, January 1973. 1 fig, 3 tab, 21 ref.

Descriptors: *Fluorides, *Rain, *Fog, *Aerosols, *Snow, Pollutant identification. Identifiers: *Ion selective electrodes, Detection limits, Sample preparation, Response time, Accu-

Soluble fluoride in rain, snow, fog or aerosols can be determined directly in samples containing down to 0.28 ppb by an inexperienced analyst after brief training with a lanthanum fluoride electrode. The method involves little sample handling, 10-ml samples suffice, a determination takes 15-22 min and the technique can be extended over 8 decades of concentrations. Probable uncertainty ranges from 10-20 percent near 0.28 ppb to 3-6 percent above 100 ppb. The general technique compares the rate of change of potential in the unknown with that in of ch nearby standards, and should be useful for trace determinations with other ion-selective electrodes as well. One possible application is the direct determination of other halides in rain. There does not seem to be any intrinsic reason why more dilute samples could not be handled if suitable standards could be prepared. (Little-Battelle)

THE INDIRECT SPECTROPHOTOMETRIC DETERMINATION OF THE SULPHATE ION WITH 2-AMINOPERIMIDINE,

Birmingham Univ. (England). Dept. of Chemistry. P. A. Jones, and W. I. Stephen.

Analytica Chimica Acta, Vol 64, No 1, p 85-92, March 1973. 2 fig, 2 tab, 11 ref.

Descriptors: *Spectrophotometry, *Sulfates, Methodology, *Surface waters, *Rain, *Aqueous solutions, Anions, Cations, Chemical reactions, Calibrations, Phosphates, Fluorides, Nitrates, Chemical precipitation, Chemical analysis, Pollutant identification.

Identifiers: 2-Aminoperimidine, Chemical interference, Accuracy, Absorbance.

A new spectrophotometric determination of the sulphate ion is described which uses 2aminoperimidine hydrochloride as a precipitati reagent. The excess of the reagent is measured at 305 nm. The procedure deals with sulphate in the range 4-120 ppm, and relies on simple calibration. The relative standard deviation for 50 ppm of sulphate is 3.7 percent. The interference of 100 ppm of phosphate, fluoride and nitrate is only slight in the determination of 50 ppm of sulphate. The method is recommended for the determination of sulphate in rain and surface waters. (Holoman-W73-10527

THE DETERMINATION OF MANGANESE IN URINE BY ATOMIC ABSORPTION SPECTROMETRY, Maryland Univ., College Park. Dept. of Chemis-

D. G. Van Ormer, and W. C. Purdy. Analytica Chimica Acta, Vol 64, No 1, p 93-105, March 1973. 3 fig, 5 tab, 32 ref.

Descriptors: "Manganese, "Chemical analysis, "Methodology, Solvent extractions, Stability, Hydrogen ion concentration, Efficiencies, Copper, Molybdenum, Iron, Mercury, Lead, Cadmium, Chelation, Heavy metals, Cations, Pollutant identification.

tam tioentricaus: "Atomic absorption spec-trophotometry, "Urine, Metal chelates, Biological samples, Sample preparation, Preconcentration, Chemical interference, Ionic interference, Bismuth, Antimony chloride, Thallium chloride, Tin chloride, Methyl isobutyl ketone, Organic sol-

An atomic absorption procedure was developed for the determination of urine manganese. Urine samples were digested with a mixture of nitric, sulfuric, and perchloric acids containing molybdate as catalyst. This wet digestion was followed by cupferron extraction into methyl isobutyl ketone to yield stable extracts of urine Mn at concentration levels quantifiable by atomic absorption spectrometry. A two-point standard addition technique was used and involved extracts of buffered, digested aliquots containing 10 and 20 ppb Mn (II) in the aqueous phase. Of the substances tested for extraction interference, only bismuth, antimony, and thallium were found to interfere. (Holoman-Battelle) W73-10528

THE FLUORIMETRIC DETERMINATION OF THE FLUORIMETRIC DETERMINATION OF PHOSPHATE WITH THAMINE, Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre. J. Holzbecher, and D. E. Ryan. Analytica Chimica Acta, Vol 64, No 1, p 147-150, March 1973. 1 fig, 4 ref.

Descriptors: "Fluorometry, "Phosphates, "Pollutant identification, "Chemical analysis, Aqueous solutions, Methodology, Chemical reactions, Anions, Cations, Heavy metals, Alkaline earth metals, Molybdenum, Nitrates, Chlorides, Bromides, Fluorides, Iodides, Silicates, Sulfides, Nickel, Manganese, Cadmium, Copper, Cobalt, Calcium, Zinc, Aluminum, Iron, Mercury, Hydrogen jon concentration. Caicium, Zinc, Aluminum, Iron, Mercury, Hydrogen ion concentration. Identifiers: "Trace levels, "Thiamine, Chemical indicators, Detection limits, Accuracy, Ionic inter-ference, Acetates, Perchlorates, Thiocyanates, Tartrates, Citrates, EDTA, Persulfates, Hexa-cyanoferrates, Chemical concentration, Chemical

Phosphate may be determined down to the one ppb level by a fluorimetric method which involves converting the phosphate to hexadimolybdatophosphate by adding ammonium molybdate to an acidified phosphate solution. The hexadimolybdatophosphate is then reacted with non-fluorescent thiamine to produce the highly fluorescent thiochrome, the fluorescence intensity of which is measured at 325 nm. The standard of which is measured at 325 nm. The standard of which is measured at 325 nm. of which is measured at 375 nm. The standard deviation of seven determinations of 50 ppb of phosphate was 3 percent; for 5 ppb the devi was less than 10 percent. Fifty ppb of phosphate was successfully determined in the presence of a 10,000-fold molar amount of acetate, chloride, 10,000-fold molar amount of acetate, chloride, nitrate, perchlorate or thiocyanate, or a 1,000-fold amount of bromide, fluoride, or tartrate. Results were also satisfactory with a 100-fold amount of citrate, EDTA, iodide or persulphate. A 10-fold amount of silicate or hexacyanoferrate (III) could be presented but larger amounts increased the fluorescence intensity; an equivalent amount of sulphide strongly quenched the fluorescence. A

10,000-fold molar amount of Ni (II), Mn (II), or Cd (II), and a 1,000-fold amount of Cu (II), Co (II), Ca (II), Zn (II), Al (III) did not interfere. A 10-fold amount of iron (III) and an equivalent amount of iron (III) could be present, but an order of magnitude increase in concentration decreased the fluorescence. Mercury (II) and mercury (I) markedly increased the fluorescence even at equimolar ratios. Important factors in the determination of phosphate with thiamine are the starting acidity, the thiamine concentration, the molybenum concentration and the final pH. (Holoman-Battelle)

DETERMINATION OF TOTAL THE DETERMINATION OF TOTAL NITROGEN IN PLANT MATERIALS WITH AN AUTOMATIC NITROGEN ANALYSER, International Atomic Energy Agency, Seibersdorf (Austria).

R. Fiedler, G. Proksch, and A. Koepf.
Analytica Chimica Acta, Vol 63, No 2, p 435-443, February 1973. 3 fig, 3 tab, 3 ref.

Descriptors: *Nitrogen, *Chemical analysis, *Plant tissues, *Laboratory equipment, Methodology, *Nitrogen compounds, Grasses, Wheat, Barley, Research equipment, Rice, Organic compounds, Rorganic compounds, Regression analysis, Automatic control, Agronomic crops, Cereal crops, Pollutant identification.

Identifiers: *Automatic nitrogen analyzer, Kjeldahl procedure, Reproducibility, Accuracy, Biological materials, Ammonium sulfate, Ammonium nitrate, Glutamic acid, Acetaniide, Ammonium pyrrollidine dithiocarbamate, Potassium nitrate.

A description is given of an automatic analyzer which has been used for the measurement of total nitrogen in chemical compounds and botanical material after the combustion method of Dumas in vacuum. Several chemical compounds and plant materials were analyzed using the nitrogen analyzer. The analysis of chemicals by means of the nitrogen analyzer yielded excellent results which entirely agree with the theoretical nitrogen content of the samples. The standard deviation of a single determination was of the order of 1 percent or less, of the nitrogen content of the sample. In the analysis of plant materials, the values obtained with the N analyzer tended to be slightly higher than those obtained by the Kjeldahl A description is given of an automatic analyzer higher than those obtained by the Kjeldahl procedure. The standard deviation of the single nitrogen analyses such as a control of the single nitro nitrogen analyzer values was of the order of 1-4 percent of the mean nitrogen content of the sam-ples, and relatively higher for wheat, barely and rice grain. Statistical evaluation of all analytical results showed that the comparative reproducibility and accuracy of the automatic analyzer and the Kjeldahl method were very good. (Holoman-Bat-Kjeld: telle) W73-10530

ATOMIC FLUORESCENCE CHARAC-TERISTICS OF COPPER IN VARIOUS PREMIXED FLAMES, Technical Univ. of Prague (Czechoslovakia). Lab. Technical Univ. of Frague (Czechosłovakia). Lac. of Flame Spectrometry.
D. Kolihova, and V. Sychra. Analytica Chimica Acta, Vol 63, No 2, p 479-482, February 1973. 2 fig. 3 tab, 20 ref.

Descriptors: *Copper, *Physical properties, *Chemical analysis, *Aqueous solutions, Cations, Anions, Heavy metals, Pollutant identification. Identifiers: *Atomic fluorescence spectroscopy, Characterization, Atomic fluorescence spectra, Detection limits, Ionic interference, Chemical interference, Sensitivity.

The atomic fluorescence of copper revealed that its spectrum consists of 9 resonance lines instead of the previously reported two. Analytical curves of the resonance fluorescence lines measured in

the premixed oxygen-argon-hydrogen flame are linear over 4 decades of concentration: from the limit of detection up to a concentration of about 15 micrograms/ml. Detection limits for all the copper lines in the 3 flames studied are tabulated. Interferences from solute volatilization and spectral interferences were found to be insignificant for 1000-fold (by weight) amounts of 28 common cations and anions in the premixed air-hydrogen and shielded air-acetylene flames. The absence of interferences and the high sensitivity of the atomic fluorescence method allowed a rapid direct determination of copper in blood serum to be made after 25-fold dilution of serum with twice-distilled water. (Holoman-Battelle)

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PROCESSES AFFECTING THE OCEANIC DISTRIBUTION OF CARBON DIOXIDE, Oregon State Univ., Corvallis. For primary bibliographic entry see Field 05B. W73-10534

A STUDY OF THE INFLUENCE OF CALCIUM ON THE EFFECTS OF DDT ON FISHES, Mississippi Univ., University. For primary bibliographic entry see Field 05C. W73-10537

LARGER DIAMETER COLUMNS FOR MODERN, HIGH SPEED LIQUID CHROMATOGRAPHY, Delaware Univ., Newark. For primary bibliographic entry see Field 02K. W73-1039

STUDIES IN CHEMICAL IONIZATION MASS SPECTROMETRY, Virginia Univ., Charlottesville, J. F. Ryan. Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor Mich., 48106, Order No. 72-33,382. Ph D Dissertation, 1972. 129 p.

Descriptors: "Organic compounds, "Chemical reactions, "Methodology, "Pollutant identification, Mass spectrometry, Alcohols, Organic acids, Ionization, Chemical analysis, Ethers.

Identifiers: "Chemical ionization mass spectrometry, CI mass spectra, Aldehydes, Ketones, Esters, Reagents, Mass spectra, CI spectra, Chemical structure, Functional groups.

Chemical structure, Functional groups.

Chemical ionization mass spectrometry (CIMS) was used to distinguish between acids, aldehydes, esters, ethers, and ketones, as well as between primary, secondary, and tertiary alcohols. Two methods were used to identify functional groups present in a sample molecule. The first was based on a determination of the sample's proton affinity relative to that of the source gas. The second method was based on the unique set of ions produced by each functional group in CI spectra using nitric oxide as a source gas. Argon-water source-gas mixtures were used to produce high and low resolution mass spectra which exhibit ions characteristic of both electron impact and chemical inoization methods of ionization. Mass spectra of different functional groups were obtained using trimethylsilyl cation as an ionization reagent. Peaks due to electrophilic attachment were observed in all cases. Finally negative ion chemical ionization mass spectra were recorded using oxygen as a reagent gas. (Holoman-Battelle)

FRESHWATER ALGAE FROM THE ITASCA STATE PARK MINNESOTA, IV. CYANOPHTA, RHODOPHYTA, CHLOROMONADOPHYCEAE, AND CRYPTOPHYCEAE, Arkanass Univ., Fayetteville. Dept. of Botany and Bacteriology.

R. L. Meyer, and A. J. Brook.

Nova Hedwigia, Vol 22, Nos. 1-2, p 649-658, 1971.

Descriptors: "Aquatic algae, "Cyanophyta, "Rhodophyta, "Aquatic habitats, "Systematics, Speciation, Lakes, Ponds, Ecological distribution, Springs, Trophic level, "Minnesota, Biological communities, Phytoplankton, Eutrophication, Oligotrophy, Dystrophy, Mesotrophy, Lidentifiers: "Cryptophyta, "Chloromonads, "Itasca State Park (Minn), Neuston, Epiphytes, Metaphyton, Aphanothece idathrata, Aphanothece indulans, Aphanothece stagnina, Chrococccus limeticus, Chrococccus turgidus, Coelosphaerium kuetzingianum, Coelosphaerium natans, Dactylococcopsis fascicularis, Dactylococcopsis raphidioides, Diplocystis aeruginosa fn. flos-aquae.

Recorded are the Cyanophyta, Rhodophyta, Chloromonadophyceae and Cryptophyceae of the region of Itasca State Park in northwestern Minnesota. The 32 genera and 107 species of Cyanophyta, one species of Rhodophyta, 2 species of Chloromonadophyceae and 4 genera with 12 species of cryptophyceae and annotated with description of habitat and principal subcommunity. (Holoman-Battelle)

DESMIDS FROM SOUTHEAST UNITED STATES OF AMERICA, (DESMIDIEEN AUS DEM SUDOSTEN DER VEREINIGTEN STAATEN VON AMERIKA),

K. Forster. Nova Hedwigia, Vol 23, Nos. 2-3, p 515-644, 1972. 397 fig, 153 ref.

Descriptors: *Aquatic algae, *Speciation, *Systematics, Aquatic habitats, Chlorophyta, *Southeast U.S.

U.S. (Lidentifiers: *Desmids, Gonatozygon brebissonii, Gonatozygon monotaenium, Netrium species, Penium species, Closterium species.

Algae collected by the author from the southern portion of the United States were compared with a collection of the late A. M. Scott from Florida, Mississippi and Louisiana. The desmid flora found expands the floral listing for the area. Of the 260 taxa found, 20 are new descriptions with 19 forms and varieties in the genera: Cosmarium (13), Euastrum (2), Groenbladia (1), Micrasterias (1), Pleurotaenium (1), Staurastrum (1) and Staurodesmus (1), (Holoman-Battelle)

METHOD FOR HIGH-SPEED LIQUID CHRO-MATOGRAPHIC ANALYSIS OF BENOMYL AND/OR METABOLITE RESDUES IN COW MILE, URINE, FECES, AND TISSUES, Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Industrial and Bicchemicals Dept. J. J. Kirkland.

Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 171-177, March/April 1973. 4 fig, 7 tab,

Descriptors: *Pesticide residues, *Fumigants, *Carbamate pesticides, Milk, Cattle, Pollutant identification, Chemical analysis, Chlorinated hydrocarbon pesticides, Urea pesticides, Organophosphorus pesticides, Penolic pesticides, Solvent extractions, Separation techniques, Solvent extractions, Separation techniques, Dalapon, Heptachlor, Phosphothioate pesticides, Phenols, Chemical degradation. Identifiers: *Benomyl, *Biological samples, *High-speed liquid chromatography, *Metabolites, Tissues, Urine, Feces, Chemical recovery, Chemical interference, Sample preparation, Cation exchange liquid chromatography, Detection limits, Benzimidazolecarbamate, Liver, Methomyl, Thiabendazole, Dicamba, Lasso, 2 6-Diethylaniline, Ethion, Strobane, Malathion,

Simazine, Tetradifon, Methoxychlor, Chloroneb, Ronnel, Guthion, N-Isopropylaniline, Diphenyl amine, Atrazine, Sevin, Diuron, Linuron, Methyl parathion, Ramrod, Absorbance, Kidneys, Fat tis-sue, Muscle, Ultraviolet photometric detector.

sue, Muscle, Ultraviolet photometric detector.

Residues of benomyl (methyl 1- (butylcarbamoyl)2-benzimidazolecarbamate) and/or methyl 2benzimidazolecarbamate, methyl 5-hydroxy-2benzimidazolecarbamate, methyl 5-hydroxy-2benzimidazolecarbamate, methyl 5-hydroxy-2benzimidazolecarbamate may be simultaneously determined in cow milk, tissues, urine, and feca.
The first step in the method consists of hydrolyzing the sample in aqueous acid to convert benomy to methyl 2-benzimidazolecarbamate and to free the metabolites from conjugates. The freed materials are then extracted into an organic solvent, the extract is cleaned up by a solvent-solvent, particioning process, and the components are determined in a single scan by high-speed strong cation exchange liquid chromatography. Recoveries of the various components average about 80 percent in cow milk and urine, with average recoveries of about 50-80 percent obtained from tissue samples and feces. Recoveries for the various compounds have been demonstrated at the 0.01-0.02-ppm level in cow milk, at the 0.05-0.1-ppm level in tissues and feces, and at the 0.2-ppm level in urine. No interference with the method was found from a number of other pesticides with tolerances in milk and meat tissues. (Holoman-Battelle) W73-10347

GAS CHROMATOGRAPHY OF ORGANONITROGEN PESTICIDES, USING A
NITROGEN-SPECIFIC DETECTION SYSTEM,
Food and Drug Administration, Buffalo, N.Y.
R. R. Laski, and R. R. Watts.

Journal of the Association of Official Analytical Chemists, Vol 56, No 2, p 328-332, March 1973. 1 tab, 14 ref.

Descriptors: *Pollutant identification, *Chemical

Descriptors: "Pollutant identification, "Chemical analysis, "Methodology, Urea pesticides, Carbamate pesticides, Chlorinated hydrocarbon pesticides, Tirazine pesticides, Organophosphorus pesticides, Phenolic pesticides, Organophosphorus pesticides, Phenolic pesticides, Harcicides, Fungicides, Monuron, Thiocarbamate pesticides, Phosphothioate pesticides. Phosphothioate pesticides. Identifiers: "Gas liquid chromatography, Organonitrogen pesticides, Retention time, Isomera, Electrolytic conductivity detector, Aldicarb, Aldicarb sulfoxide, Aldicarb sulfone, Fenuron, Fluometruon, CDAA, Neburon, Diuron, EPTC, Dichlobenil, Propham, Terrazole, Butylate, Vernolate, Pebulate, Isolan, Molinate, Travid, Propoxur, Propachlor, Cycloate, Chlorpropham, Terratic, Chlorprepham, Trifluralin, Dazomet, Benefin, Bidrin, Diallate, CDEC, Azodrin.

A gas-liquid chromatographic system with a nitrogen-specific detector (electrolytic conductivity detector) was investigated for the determination of 95 organonitrogen pesticides. Each compound was chromatographed, using DC-200 liquid phase on a solid support of 80-100 mesh Chromosorb W (HP). Retention times and response data are given for these pesticides. (Holoman-Battelle) W73-10548

SIMULTANEOUS QUANTITATION OF SAL-MONELLA SPECIES AND PSEUDOMONAS AERUGINOSA. I. POLLUTED WATERS. II. PERSISTENCE OF PATHOGENS IN SLUDGE TREATED SOILS. III. ANALYSIS OF WASTE TREATMENT SLUDGES FOR SALMONELLA SPECIES AS A SURVEILLANCE TOOL,

For primary bibliographic entry see Field 05B. W73-10549

Group 5A—Identification of Pollutants

HALOGENATED COMPOUNDS FOR THE SEN-SITIVE DETECTION OF CLOSTRIDIA BY GAS CHROMATOGRAPHY,

Yale Univ., New Haven, Conn. Div. of Health

Science Resources.

B. M. Mitruka, and M. Alexander.

Canadian Journal of Microbiology, Vol 18, No 10, p 1519-1523, October 1972. 4 tab, 9 ref.

Descriptors: *Pollutant identification, *Anaerobic bacteria, *Clostridium, Alcohols, Organic acids, 2 4-D, 2 4 5-T, *Gas chromatography. Identifiers: *Electron capture gas chromatography, *Cometabolism, Sensitivity, Substrates, Sample preparation, Metabolites, Culture media, Clostridium species, Chlorophenols, Methylphenoxyacetates, Hydrocarbons, Acetoin, n-Butanol, Isobutanol, Methanol, Valeric acid, Propionic acid, Isobutyric acid, Crotonic acids, Isopentanol, Diacetyl, Isovaleric acid, Acrylic acid, Pentanol, Butanediol.

Metabolites formed by the equivalent of 230 to 3000 cells of several Clostridium species were detected by use of a gas chromatograph fitted with an electron capture detector. A variety of organic acids, alcohols, and ketones were produced by growing cultures of the 10 species tested. Compounds excreted by 300 to 3000 cells of 12 strains of Clostridium perfringens were detected, and both common and dissimilar metabolites were formed by these strains. The sensitivity for detectformed by these strains. The sensitivity for detecting six Clostridium species increased up to several thousandfold when chlorophenoxyacetates were added to the medium, the increase being most marked with 2,4-di- and 2,4,5-trichlorophenoxyacetates. The results show that cometabolism is useful in increasing the sensitivity and speed of detection of Clostridium species. (Holoman-Battelle) W73-10550

A STUDY TO IMPROVE DISSOLVED OXYGEN ANALYSIS TECHNIQUES TO FACILITATE WATER QUALITY FIELD SURVEY APPLICA-

Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
R. W. Raible, and M. K. Testerman.

Available from National Technical Information Service as PB-221 019, \$3.00 in paper copy, \$0.95 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No 13, June 1973, 71 p, 22 fig, 22 tab, 4 ref. OWRR A-017-ARK (1). 14-31-0001-3804.

Descriptors: *Dissolved oxygen analyzers, *Dissolved oxygen, *Electrodes, *Instrumentation, Water quality, Water temperature, Pollutant Water qualit identification.

Identifiers: Oxygen sensor, *Temperature com-pensated electrode.

Studies were made of the temperature characteristics of dissolved oxygen electrodes having a large surface area. Large area electrodes proved to have much longer lifetime between rejuvenations. Many measurements of dissolved oxygen in water need to be made in field situations where recalibration techniques would be difficult and where making temperature corrections is time consuming for operators who may be making numerous measurements. This study was directed toward design of a compensation circuit for a dissolved oxygen electrode which will give the best possible measurement over a large water temperature range of 5C - 35C without the necessity of recalibration. Studies 35C without the necessity of recalibration. Studies were made of the temperature characteristics of dissolved oxygen probes and several electronic circuits with different configurations and components are described. Experimental data using two of the circuits are resported. One method involved using an integrated circuit multiplier module. The best temperature compensation was obtained for a circuit based on a design in which two thermistors were incomparated. (Roberson-Artwo thermistors were incorporated. (Roberson-Ar-W73-10559

SODIUM AND MAGNESIUM SULFATE ION PAIRING: EVIDENCE FROM RAMAN SPECTROSCOPY, Rhode Island Univ., Kingston. Dept. of Chemis-

For primary bibliographic entry see Field 01B. W73-10650

INORGANIC PHOSPHORUS IN SEAWATER, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02K.

A NETWORK FOR CONTINUOUS MONITOR-ING OF WATER QUALITY IN THE SABINE RIVER BASIN, TEXAS AND LOUISIANA,

Geological Survey, Austin, Tex. J. F. Blakey, and P. W. Skinner. Geological Survey open-file report, May 1973. 37 p., 1 fig., 3 tab, 3 ref.

Descriptors: "Water quality, "Remote sensing, "Networks, "Monitoring, River basins, Texas, Louisiana, Data collections, Data transmissions, Control systems, Planning, Chemical analysis, Telemetry, Remote control, Network design, Methodology, Streamflow, Water temperature. Identifiers: "Sabine River basin (Tex and La).

The proposed water-quality network for the Sabine River basin of Texas and Louisiana con-Sabine River basin of Texas and Louisiana consists of nine monitoring stations, a central-control station, a slave-central station, and a leased-line telecommunications system. This monitoring network would provide continuous transmission of water-quality data to the office of the water manager. Level I operations at a proposed site would monitor current and potential problems, water-quality changes in subreaches of streams, and water-quality trends in time and place. Level I operations would monitor current or potential problems. An optimum system would require Level I operations at all nine stations. A minimum system would require Level II operations at most of the stations. (Woodard-USGS)

GEOHYDROLOGY, Kennecott Copper Corp., Lexington, Mass. For primary bibliographic entry see Field 04B. W73-10798

TRACE ELEMENT ANALYSES OF COLUMBIA RIVER WATER AND PHYTOPLANKTON Battelle Memorial Inst., Richland, Wash. Pacific

Northwest Labs.
C. E. Cushing, and L. A. Rancitelli.
Northwest Sci. Vol 46, No 2, p 115-121. 1972.

Identifiers: Neutron activation analyses,
Asterionella-Formosa, *Columbia River,
Fragilaria-Crotonensis, Melosira-Sp, Metals, *Columona Melosira-Sp, Metals, Melosira-Seasonality, Minerals, P Synedra-Sp, Water. Phytoplankton, River, Seasonality, Sp, Tabellaria-Sp, *Trace elements,

Water and phytoplankton samples were collected upstream from the Hanford Atomic Works Project at 5 'ecologically significant' times of the year for at 3 'ecologically significant times of the year for analysis by neutron activation techniques. Collections were in Nov. (fall phytoplankton bloom), Feb. (mid. winter), April (spring phytoplankton bloom), June (summer high-water), and Aug. (summer stratification). Elements analyzed in the phytoplankton were: Ag, Br, Co, Cr, Cs, Fe, Hg, K, Na, Rb, Sb, Sc, Se and Zn. Additional elements lyzed in the water were: As, Au, Cu, Mn and analyzed in the water were: As, Au, Cu, Mn and U. Monthly samplings of phytoplankton and water were analyzed by standard methods for Ca, Mg, Na, K, Zn, Cu and P for comparison. Net plankton is dominated by Asterionella formosa and Fragilaria crotonesis with significant populations of Tabellaria sp., Synedra sp. and Melosira sp. Concentration factors of the elements in the shottonlankton are presented. Neutron activation phytoplankton are presented. Neutron activation

techniques were shown to be clearly superior to conventional techniques for detection of micro quantities.—Copyright 1973, Biological Abstracts, Inc. W73-10806

BACTERIAL IDENTIFICATION BY MICRO-

Veterans Administration Hospital, Boston, Mass. E. A. Boling, G. C. Blanchard, and W. J. Russell. Nature, Vol 241, No 5390, p 472-473, February 16, 1973. 1 fig, 1 ref.

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Descriptors: *Pollutant identification, Cultures, Streptococcus, E. coli, Speciation, Separation techniques. Identifiers:

identifiers: *Microcalorimetry, Enterobacter aerogenes, Klebsiella, Proteus vulgaris, Enterobacter cloacae, Proteus rettgeri.

Seventeen species from 10 genera of Enterbac-teriaceae were grown on brain-heart infusion (BHI) medium and analyzed by microcalorimetry (BHI) medium and analyzed by microcalorimetry as a means of differentiating species. The profiles were recorded on a strip chart recorder for periods up to 14 hrs. Using the curves, it was possible to discriminate between all the species tested. Profiles are included for Enterobacter aerogenes, Klebsiella, Proteus vulgaris, Enterobacter cloacae, Escherichia coli, and Proteus rettgeri. Streptococcus faecalis was also among the bacteria investigated. Microcalorimetry promises to be a rapid and specific means of characterization of Enterobacteriaceae and possibly other bacteria. (Little-Battelle) (Little-Battelle) W73-10848

OCCURRENCE OF SOME CHLORINATED ALIPHATIC HYDROCARBONS IN THE EN-

VIRONMENT,
The Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-10850

A SIMPLE MODIFICATION OF A FLAME PHOTOMETER FOR ROUTINE TRACE POTASSIUM ANALYSIS, Bell Telephone Labs., Inc., Reading, Pa. W. R. Knolle.

Applied Spectroscopy, Vol 27, No 2, p 142, March/April 1973. 1 fig, 4 ref.

Descriptors: *Potassium, *Aqueous solutions, *Chemical analysis, *Flame photometry, Pollutant identification, Instrumentation, Laboratory equipent, *Trace elements. Identifiers: Trace levels, Detection limits.

A flame photometer was modified for potassium analysis in the ppb range in solution in order to avoid the cost and inconvenience involved in avoid the cost and inconvenence involved in changing the grating and photomultiplier tube on a general purpose instrument. An instrumentation Laboratory model II. 153 atomic absorption spec-trometer was used in the flame emission mode with an RCA 1P21 photomultiplier tube operated at 1200 V. The modification consisted of setting at 1200 V. The modification consisted or setting the grating of the spectrometer to zero wave length and using it as a mirror instead of as a monochromator. A first order least squares analysis of the data obtained from standards prepared with deionized water, which had been demineralized and filtered, yielded a correlation coefficient of 90001 Eine 2 ml samples of dilite HE water and intered, yellold a correlated collected of 0,99991. Five 2-ml samples of dilute HF were analyzed for K, and the calculated standard deviation multiplied by a statistical factor yielded 1.1 mg tion multiplied by a statistical factor yielded 1.1 mg of K as a detection limit. This easily realizable working limit is 2 orders of magnitude better than that achieved without the modification. This modification should be generally applicable to any emission flame photometer where the detection limit is restricted by photomultiplier tube and grating response. (Holoman-Battelle) W73-10852 RAPID DETERMINATION OF VERY LOW RAPID DETERMINATION OF VERY LOW MITROGEN LEVELS IN WATER, California Univ., Davis. Dept. of Applied Science. S. F. Bankert, S. D. Bloom, and F. S. Dietrich. Nature, Vol 242, No 5395, p 270-271, March 23, 1973. 2 fig, 1 tab, 9 ref.

Descriptors: "Assay, "Water analysis, Methodology, "Pollutant identification, "Radioactivity techniques, Nutrients, "Nitrogen, Gamma rays, Chemical analysis, Potable water, Rivers, Municipal water, "Neutron activation analysis. identifiers: *Trace levels, Charged particle activa-tion analysis, N-14, Nitrogen radioisotopes, Sen-sitivity, Detection limits, Lake Tahoe, Sacramento River, Accuracy.

A new approach to N-14 assay is associated with the evaporated detritus of less than 4 ml of water. This method, termed charge particle (nuclear) activation analysis (CPAA), has an activation and subsequent decay of minus 5.9 MeV and 71.0 s, respectively. The presence of nitrogen is measured by counting the number of 2.31 MeV and 71.0 s, respectively are to the control of the co

CHLORINATED HYDROCARBON PESTICIDES AND RELATED COMPOUNDS IN ADIPOSE TISSUE FROM PEOPLE OF JAPAN,

Environmental Protection Agency, Chamblee, Ga. Chamblee Toxicology Lab. A. Curley, V. W. Burse, R. W. Jennings, E. C.

Villanueva, and L. Tomatis. Nature, Vol 242, No 5396, p 338-340, March 30, 1973. 4 fig, 2 tab, 13 ref.

Descriptors: Chemical analysis, "Chlorinated hydrocarbon pesticides, "Polychlorinated biphenyls, "Pesticide residues, "Pollutant identification, Methodology, Dieldrin, DDT, Insecticides, Fungicides, Absorption, "Gas chromatography identifiers: "Animal tissues, "Adipose tissue, Heptachlor epoxide, Isomers, Metabolites, Hexachlorobenzene, GC-Mass spectrometry, Column chromatography, Sample preparation, Gas liquid achtoroenzene, GC-Mass spectrometry, Column chromatography, Sample preparation, Gas liquid chromatography, Lindane, Japan, o p' DDE, p p' DDE, p p' DDE, p p' DDT, Fat tissue, Electron capture gas chromatography, alpha-Hexachlorocyclohexane, gamma-Hexachlorocyclohexane, beta-Hexachlorocyclohexane, excludes a conductor of the conductor of

Japanese autopsy adipose tissue samples were analyzed by electron capture gas chromatography and the following chlorinated hydrocarbons were found: hexachlorobenzene (HCB), polychlorinated biphenyls, dichlorodiphenyl trichlorocethane (DDT), dieldrin (HEOD), heptachlor epoxide, and the alpha, gamma, and beta isomers of hexachlorocyclohexane (HCCH). Two-column case chromatography. Causton condum column gas chromatography, Coulson conduc-tometry and 'Florisil' elution patterns were ac-cepted as sufficient confirmation for the presence of all reported compounds except hex-achlorobenzene and PCBs. HCB was substanactionocenzene and PCBs. RCB was substantiated by electron capture and electrolytric conductometric gas-liquid chromatography and gas chromatography-mass spectrometry. The presence of PCB's was verified by electrolytic conductivity and gas chromatography-mass spectrometry. All samples analyzed were positive for PCBs. Eighty percent of the samples had a PCB concentration of less than 1.0 ppm. (Holoman-Bat-W73-10854

ORGANIC MERCURY COMPOUNDS IN ORGANIC MERCURY COMPOUNDS IN COASTAL WATERS, Connecticut Univ., Groton. Marine Sciences Inst. W. F. Fitzgerald, and W. B. Lyons. Nature, Vol 242, No 5398, p 452-453, April 13, 1973. 2 tab, 18 ref.

Descriptors: *Mercury, *Pollutant identification, Rivers, Heavy metals, Chemical analysis, Water analysis, Sea water, Trace elements, Water

analysis, Sea waters, "Organic mercury, sampling. Identifiers: "Coastal waters, "Organic mercury, Flameless atomic absorption spectrophotometry, Metal complexes, Sample preparation, "Long Island Sound, Photooxidation.

Determinations of total and inorganic mercury were made on coastal and river waters near Long Island Sound. Two different 100-ml sets of sam-Island Sound. Two different 100-ml sets of samples were collected in glass bottles and acidified to pH 1.0 with redistilled concentrated nitric acid. One set was analyzed immediately for inorganic Hg; the other was photooxidized for 24 hr and aliquots were analyzed for total Hg. Flameless atomic absorption spectrophotometry was used in both cases. The total Hg concentrations were 0.045-0.078 ppb and those of inorganic Hg were 0.021-0.033 ppb. It is significant that as much as 50-60 percent of the mercury present in those waters may exist either as organic compounds or in association with organic matter. (Holoman-Battelle) W73-10855

FROZEN PREPARED MICROBIOLOGICAL CULTURE MEDIA, Philadelphia Coll. of Pharmacy and Science, Pa. Dept. of Bacteriology. B. Witlin.

Mycopathologia et Mycologia Applicata, Vol 49, No 2-3, p 137-139, March 15, 1973. 8 ref.

Descriptors: *Storage, *Bacteria, *Freezing, Cultures, Microbiology.

Identifiers: *Culture media, *Agars, *Broths, Identifiers: "Cutture media, "Agars, "Broths, Nutrient broth, Nutrient agar, Nutrient gelatin, Trypticase soy broth, Trypticase soy agar, Tryp-ticase soy blood agar, Endo agar, E.B.M. agar, MacConkey agar, Russell's double sugar agar, Tri-ple sugar iron agar, Sabouraud broth, Sabouraud agar, M.R.-V.P. broth, Dunham's peptone solu-tion, Purple milk, Litmus milk, Litman agar, Chocolate agar, Martin-Lester transgrow media, Loeffler's media, Lowenstein-Jeasen media, Thioglycollate broth, Phenol red broth, Mannitol, Arabinose, Xylose, Glycerol

Arabinose, Xylose, Trehalose

Thirty culture media were stored in a freezer at minus 5 C and minus 20 C and evaluated at weekly intervals for periods of one year. After storage, intervals for periods of one year. After storage, the media were removed, ovserved for physical appearance, thawed at room temperature, inoculated with test organisms (Streptococcus, Staphylococcus, Enterobacter, Salmonella, Pseudomonas, Proteus, Candida, Trichophyton, Neiserria, Corynebacterium, Mycobacterium) and incubated. With the exception of blood agar, the forces and thawed media were satisfactory with frozen and thawed media were satisfactory with regard to appearance, consistency, and as a sub-stitute for biochemical reactions. Consequently, single freezing of culture media provides a practical and convenient method for preserving and storing noncellular substrates for long periods. (Little-Battelle)

AGAR-PLUG CUTTER AND INOCULATION DEVICE, Western Regional Research Lab., Berkeley, Calif.

R. H. Kurtzman, Jr. Mycologia, Vol 65, No 1, p 236-239, January-February 1973. 3 fig, 5 ref.

Descriptors: *Laboratory equipment, Cultures, Design, Microbiology, Methodology.

Identifiers: *Agar-plug cutter, *Inoculation,

Agars.

An agar-plug cutting device is described which can be made in a wide variety of sizes and can be sterilized by any ordinary means. The device is constructed from a cutoff No. 18 syrings needle, a serum stopper, and an antibiotic assay cup or other short length of stainless steel tubing. The tubing which serves as a cutter is drilled lengthwise to allow the syringe needle to be inserted. A second, larger hole is drilled lengthwise in the tubing, but only to a depth of about 2 mm. The serum stopper is placed over the needle to provide an air-tight seal so that when the cutter is inserted into the agar, the vacuum created by withdrawing the needle will retain the plug in the tubing. The needle is also used to eject the plug onto the plate to be inoculated. A control unit was also developed to improve the use of the device. Using the completed device, it was possible to inoculates 30 plates in 10 minutes. (Little-Batte¹¹e)

SLIME-INHABITING GEOFUNGI IN A POL-LUTED STREAM (WINTER/SPRING), Washington Univ., St. Louis, Mo. Dept. of Biolo-

gy. For primary bibliographic entry see Field 05C. W73-10659

MICRODETERMINATION OF FORMIC, OXAL-IC AND ACETIC ACIDS IN THEIR MIXTURE BY SELECTIVE OXIDATION, Allahabad Univ. (India). Chemistry Labs.

P. K. Jaiswal.

Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 335-336, March 6, 1973. 3 ref.

Descriptors: *Chemical reactions, Methodology, Organic acids, Oxidation, Chemical analysis, Pollutant identification. Identifiers: *Oxalic acid, *Acetic acid, Mixtures, *Formic acid, Silver, Ditellurato argentate, Diperiodato cuprate, Chemical interference, Accuracy, Precision, Ditellurato cuprate, Reagents.

Formic, oxalic and acetic acids have been deter-Formic, oxalic and acetic acids have been determined in their mixture by selective oxidation with Ag (III) and Cu (III) reagents. Ag (III) oxidizes only formic acid under specific conditions. Diperiodato cuprate (III) solution oxidizes only formic and oxalic acids under verified conditions, whereas ditellurate cuprate (III) solution oxidizes forms the conditions oxidizes for the conditions o formic, oxalic as well as acetic acids. Thus by the use of these three oxidants the three acids can be use of these three oxidants the three acids can be determined separately in their mixture. Formic, oxalic and acetic acids require 2, 2 and 8 equivalents of oxidant for their complete oxidation. The quantities of the three acids have been calculated in g.mole. Experiments have been repeated several times with about 0.00002-0.00006 g.moles of substance and results are obtained with plus or minus 0.8 percent deviation. Interferences are observed in the presence of other inorganic and organic substances. (Holoman-Battelle) W73-10860

SEPARATION AND PRECONCENTRATION, Leeds Univ. (England). School of Chemistry.

Leeds Univ. (England). School of Chemistry. H. Irving. Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 264-271, March 6, 1973. 5 fig, 3 tab, 62 ref.

Descriptors: *Separation techniques, *Water analysis, *Organic compounds, *Aqueous solutions, *Heavy metals, Ion exchange, Evaporation, "Heavy metals, Ion exchange, Evaporation, Reverse osmosis, Adorption, Absorption, Sea water, Mercury, Pesticides, Lead, Iron, Waste water (Pollution), Gold Aluminum, Cobalt, Manganese, Nickel, Chromium, Cadmium, Magnesium, Beryllium, Molybdenum, Neutron activation analysis, Gas chromatography, Sodium, Potassium, Froth flotation, Chelation, Foam fraction, Distillation, Cesium, Strontium.

Group 5A-Identification of Pollutants

Identifiers: "Preconcentration, "Biological samples, Molecular sieves, Freeze concentration, Volatilization, Coprecipitation, Gel filtration, Gel permeation, Ultrafiltration, Electrophoresis, Sublimation, Partition chromatography, Scaveaging, Gas solid chromatography, Sr-90, V-90, Carlurium, Amalgamation, Masking, Chemical interference, Ashing, Sample preparation, Liquid-liquid extraction, Electrodeposition, Adsorbeats, Uranium, Silver, Antimony, Bismuth, Gallium, Zirconium, Hafnium, Scandium, Lanthanum, Cerium, Tungsten, Indium, Vanadium, Paper chromatography, Thin layer chromatography, Silylation, Abate, Detection limits, Rubidium, Yttrium.

A general review is given of methods for separa-tion and preconcentration of analytes. Among the methods of preconcentration reviewed are ashing, tion and preconcentration of analytes. Among the methods of preconcentration reviewed are ashing, evaporation, freeze concentration, froth flotation, reverse cosmosis, adoption, liquid-diquid extraction, amalgam methods, volatilization, electrodeposition, and ion exchange. Separation methods reviewed included molecular sieves, gel filtration, gel permeation, gaseous diffusion, ultrafiltration, electrophoresis, sublimation, distillation, foam fractionation, absorption chromatography, ass-solid chromatography, scavenging by colloids, crystallization, freeze separation, zone refining, paper, partition, and thin layer chromatography, liquid-liquid extraction, ion exchange, electrodeposition, amalgam methods, and masking and demasking. Several of the techniques are discussed in relation to analysis of water for heavy metals, organic compounds, and other contaminants. (Little-Battelle)

NEW METHODS FOR THE DETERMINATION OF ELEMENTS IN TRACE AMOUNTS, Birmingham Univ. (England). Dept. of Chemistry. R. Belcher.

Zeitschrift fur Analytische Chemie, Vol 263, No 4, p 257-263, March 6, 1973, 8 fig. 25 ref.

p 257-263, March 6, 1973. 8 fig, 25 ref.

Descriptors: *Methodology, *Pollutant identification, Mass spectrometry, Chemical reactions, Anions, Cations, Cobalt, Sulfates, Spectrophotometry, Nitrites, Volumetric analysis, Nitrates, Bromides, Iodides, Chlorides, Phosphates, Molybdenum, Heavy metals, Silcates, Amino acids, Polarographic analysis, Manganese, Lead, Halogens, Phosphorus, Sulfur, Nitrogen, *Trace elements, Catalysts, Copper, Nickel, Alkali metals, Separation techniques, Chemical analysis, Titanium. Identifiers: *Trace levels, *Chemical elements, Molecular emission spectroscopy, Metal chelates, Gas liquid chromatography, Enzymatic techniques, Candoluminescence, Reagents, Chemical indicators, Detection limits, Chemical interference, Ionic interference, Sensitivity, Apoenzymes, Charge transfer reactions, Palladium, Arsenates, Vanadates, Complexation, Atomicabsorption spectrophotometry, Bismuth, Anisonate Persearth Alexanter Aceasic Sclenium.

absorption spectrophotometry, Bismuth, Antimony, Rare earth elements, Arsenic, Selenium, Tellurium, Polyphenol oxidase, Platinum, Mass spectra, Hafnium, Zirconium.

Recent methods for the determination of elements in trace amounts are discussed, which have been mainly developed in the author's laboratories. The review comprises the following sections: reagents and reactions, charge transfer reactions, candoluminescence, molecular emission spectroscopy in flames, enzymatic methods, gas-liquid chromatography of metal chelates, and mass spectrometry of metal chelates. (Holoman-Battelle) W73-10862

TITRIMETRIC MICRODETERMINATION OF THRIME I RICE MICKODE IERMINATION OF MICKEL AND COBALT, SEPARATELY AND IN PRESENCE OF EACH OTHER, Allahabad Univ. (India). Chemistry Labs. S. Saxena, and J. D. Pandey. Zeitschrift fur Analytische Chemie, Vol 263, No 3, p 208, February 7, 1973.

Descriptors: "Nickel, "Cobalt, "Volumetric analysis, "Pollutant identification, Heavy metals, Cations, Alkaline earth metals, Chemical analysis, Lead, Iron, Aluminum, Magnesium, Cadmium, Beryllium, Calcium, Zinc, Dyes.
Identifiers: "Ionic interference, Chemical indicators, Accuracy, Rare earth elements, Sensitivity, Chemical interference, Gallium, Neodymium, Gadolinium, Tellurium, Niobium, Rhenium, Talium, Barium, Indium, Praseodymium, Uranium, Xylenol orange, Hippuric acid, Chromazurol red

A new method for the determination of Ni and Co, separately and in mixture is based on titration with hippuric acid. Xylenol orange (and chromazurol red S) are employed as indicators. Maximum error observed for Ni and Co was 2.0 percent and 1.9 percent, respectively, when determined separately, and 1.9 percent and 1.9 percent, respectively, when determined from a mixture. Amounts taken were in the range of about 60-400 mg. The following ions caused interferences: Pb, Pe, Ga, Al, Nd, Gd, Zr, Te, Nb, Re. No interferences are caused by Tl, Mg, Cd, Be, Ca, Ba, Zn, In, Pr, U. A most important precaution in this method is a thorough cleaning of the beakers used with sodium carbonate or chromic acid, since otherwise the exact color change may not be obtained. (Holoman-Battelle) W73.10863

THE DISTRIBUTION OF HEAVY METALS IN SEDIMENTS OF SORFJORD, WEST NORWAY, Edinburgh Univ. (Scotland). Grant Inst. of Geolo-

gy.
For primary bibliographic entry see Field 05B.
W73-10865

OXYGEN DEMAND OF EFFLUENT FROM A BLEACHED KRAFT PULP MILL, Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.

Biology. J. G. Ogden, III. Water, Air, and Soil Pollution, Vol 1, No 4, p 365-374, September 1972. 1 fig, 6 tab, 9 ref.

Descriptors: "Oxygen demand, "Effluents, "Pulp and paper industry, Chemical oxygen demand, Biochemical oxygen demand, Organic loading, Water sampling, Water chemistry, Gas chro-matography, Industrial wastes, "Pulp wastes, Aeration, Mechanical control, Hydrogen ion con-centration, Water properties, Color, Sulfates, Hydrogen sulfide, "Chlorides, Sea water, Suspended solids, Dissolved solids, "Canada. Identifiers: Characterization, "Bleached pulp wastes, Gravimetric analysis, Total oxygen de-mand, Settleable solids, Transparency.

mand, Settleable solids, Transparency.

Since the fall of 1967, a 160 hectare former tidal estuary has been dammed and used as a waste water treatment facility for a 500-700 metric tons per day bleached sulfate kraft pulp mill at Abercrombie Point, Nova Scotia. The treatment system is subdivided into a 16 hectare settling pond to remove course suspended solids, and a 144 hectare stabilization pond. Volume of the two basins indicates a total detention time of 15 to 25 days, depending upon plant flow rates. Total solids input to the treatment system (determined by evaporation at 105 C) amounts to 1.29 gl. Settling and oxidation in the basin accounts for approximately 0.29 gl. Because of plant flow rates of 95 million per day, nearly 100 metric tons of solids are released to the marine environment daily. Determinations indicate that at present loadings, more than 10 metric tons of BOD per day are entering a poorly flushing coastal environment. Chemical Oxygen Demand (COD) values are from 2 to 10 times greater than BOD. Effects of mechanical aeration and massive lime treatment of the effluent for removal of solids and 02 demand are discussed. Consequences of alternative treatment methods and continued utilization of the treatment basin are considered. (Holoman-Battelle)

W72 10060

EFFECT OF SEAWATER SOLUBLE FRACTION EFFECT OF SEAWATER SOLUBLE FRACTI OF KEROSENE ON CHEMOTAXIS IN MARINE SNAIL, NASSARIUS OBSOLETUS, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05C. W73-10872

HALOGENATED HYDROCARBONS IN AND OVER THE ATLANTIC, Reading Univ. (England). Dept. of Applied Physical Sciences. cal Sciences.
For primary bibliographic entry see Field 05B.
W73-10873

VIBRIO PARAHAEMOLYTICUS
METHODOLOGY FOR ISOLATION FROM
SEAFOODS AND EPIDEMIC SPECIMENS,
Food and Drug Administration, Washington, D.C.
Bureau of Foods.
M. Fishbein, and B. Wentz.
Journal of Milk and Food Technology, Vol 36, No
2, p 118-123, February 1973, 5 fig, 4 tab, 7 ref.

Descriptors: "Pathogenic bacteria, "Isolation,
"Analytical techniques, Methodology, Pollutant
identification, Marine bacteria, Public health,
Human diseases, Enteric bacteria, Anaerobic bacteria, Pish, Shellitish, Crustaceans, Marine
animals, Epidemics.
Identifiers: "Vibrio parahaemolyticus, "Seafood,
"Feces, Culture media, Biochemical tests, Vibrio
alginolyticus, Marine environment, Selective
media, Enrichment.

The newly revised procedure in the Bacteriological Analytical Manual of the Food and Drug Administration for the analysis of Vibrio parahaemolyticus in seafood samples and epidemic specimens, media and test regeant formulations, enrichment and isolation procedures, and the biochemical and serological diagnostic criteria of Vibrio parahaemolyticus are presented. The biochemical schema for the separation of other interfering marine vibrios is included. (Holoman-Battelle)

REDUCTION OF MERCURY WITH CYSTEINE IN COMMINUTED HALIBUT AND HAKE FISH PROTEIN CONCENTRATE, National Marine Fisheries Service, Seattle, Wash. Pacific Fishery Products Technology Center. For primary bibliographic entry see Field 05C. W73-10878.

A STUDY OF CILIATE PROTOZOA FROM A SMALL POLLUTED STREAM IN EAST-CE-NTRAL ILLINOIS, Maryland Univ., College Park. Dept. of Zoology. For primary bibliographic entry see Field 05D. W73-10886

A BIOLOGICAL EVALUATION OF THE MOLYBDENUM BLUE METHOD FOR ORTHOPHOSPHATE ANALYSIS, Water Chemistry Provisionsin Univ., Madison. Water Chemistry Pro-

gram. C. P. Walton, and G. F. Lee. Verhandlungen der Internationalen Vereiningung fur Theoretische Limnologie, Vol 18, p 676-684, 1972. 5 fig, 2 tab, 9 ref.

Descriptors: *Analytical techniques, *Measurement, *Phosphates, Nutrients, Algae, Bioassay, Plant growth, Laboratory tests.
Identifiers: *Molybdenum blue method, *Orthophosphate, Lake Mendota (Wis).

One of the primary utilities of orthophosphate measurements is to estimate the concentration of

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

biologically available phosphorus, thus it is essential that the relationship between the soluble orthophosphate concentrations determined by the molybdenum blue method and the soluble phosphate concentrations that are available as plant nutrients be known. This investigation compares the soluble reactive molybdenum blue pares the soluble reactive molypodenum onle phosphorus present in water samples to the amount of algal growth as achieved in a stan-dardized bioassay procedure where the growth is limited by the phosphorus concentration present in the sample. The Lake Mendota waters tested were limited by the phosphorus concentration present in the sample. The Lake Mendota waters tested were fortified with the nutrients contained in the Provisional Algal Assay Procedure media such that the growth of the test organism would be limited by the amount of phosphorus available in the test water. There was no discrepancy between the amounts of growth of the test organisms in the lake water, sediment extracts, and algal detritus extracts predicted by the molybdenum blue soluble orthophosphate and the growth of the test organism in the test media with a corresponding amount of soluble orthophosphate added. It is recommended that both chemical and biological tests be applied before extensive reliance is made on the molybdenum blue method. (Jones-Wisconsin) sin) W73-10943

TRACE METALS IN CORES FROM THE GREAT MARSH, LEWES, DELAWARE. Delaware Univ., Newark. Dept. of Geology. For primary bibliographic entry see Field 02J. W73-10971

ON THE ISOLATION AND THE BAC-TERIOLYTIC ACTIVITY OF SOME MYX-OBACTERIA ISOLATED IN WATER (SUR UBACTERIA ISOLATED IN WATER (SUR L'ISOLEMENT ET L'ACTIVITE BACTERIOLYTIQUE DE QUELQUES MYXOBACTERIES ISOLEES DE L'EAU), Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.

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R.

OR

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Hydrobiologie.
J. Raverdy.
Water Research, Vol 7, No 5, p 687-693, May 1973. 4 tab, 21 ref.

Descriptors: *Isolation, *Cytological studies, *Pollutant identification, Water sampling, Methodology, Water pollution, Rivers, E. coli. Identifiers: *Myxobacteria, *Fate of pollutants, *Bacteriolytic activity, Gram-negative bacteria, Fractionique activity, Gram-negative bacteria, Gram-positive bacteria, Biochemical characteristics, Bacteriolysis, Salmonella species, Arizona, Shigella dysenteriae, Proteus species, Providencia, Klebsiella pneumoniae, Enterobacter cloacae, Citrobacter freundii, Hafnia, Serratia, Benedersont asseriae Adiatabater resolutions. Pseudomonas species, Acinetobacter species, Vibrio species, Staphylococcus species, Bacillus

Four strains of Myxobacteria were isolated in samples of river water. Their bacteriolytic activity
was studied in relation to 24 strains of Gram-negawas studied in relation to 24 strains of Gram-negative baciliti and 10 strains of Gram-positive bacteria. Their morphology and cultural characteristics are described and their role in the phenomena of self-purification is discussed. (Holoman-Battelle) W73-10999

EXPERIMENTAL TREATMENT OF SURFACE WATER PURIFICATION BY LAGOONS: CHEMICAL AND MICROBIOLOGICAL ASPECTS, (TRAITEMENT EXPERIMENTAL D'EPURATION D'UNE EAU DE SURFACE PAR LANUACES. ACRECES CHIMIQUIES ET ANUACES. ACRECES CHIMIQUIES ET LANUNAGE: ASPECTS CHIMIQUES ET MICROBIOLOGIQUES), Institut Pasteur, Lille (France). Laboratoire d'-

Hydrobiologie. For primary bibliographic entry see Field 05B. W73-11000

ECOLOGY OF VIBRIO PARAHAEMOLYTICUS IN CHESAPEAKE BAY, Georgetown Univ., Washington, D.C. Dept. of Biology.

For primary bibliographic entry see Field 05C. W73-11001

EVALUATION OF COLIFORM TESTS FOR CHLORINATED SECONDARY EFFLUENTS, Illinois State Water Survey, Peoria. Water Quality

Journal Water Pollution Control Federation, Vol 45, No 3, p 498-506, March 1973, 5 fig. 4 tab. 10

Descriptors: *Cultures, *Chlorination, *Separa-tion techniques, Sewage effluents, Coliforms, Pol-lutant identification, *Ullinois, Waste water treat-ment, Treatment facilities. Identifiers: *Fecal coliforms, *Membrane filter, Most probable number test, Method evaluation.

The purpose was (1) to determine whether or not the LES two-step enrichment MF technique for total coliforms assay on chlorinated effuents is comparable to the recommended MPN method and (2) to compare fecal coliform detection by M-FC MF technique on chlorinated secondary effuents with the MPN procedure. Grab samples of secondary effluent were collected from three Ilinois treatment plants, chlorinated with up to 6 mg/l of chlorine, stirred, dechlorinated after various periods of contact by sodium thiosulfate, and assayed. The results showed that the LES two-step MF procedure is comparable to the completed MPN techniques for total coliform detection in chlorinated secondary effluents. Total coliform secondary effluents in the context of the contex recovery in chlorinated effluent by the LES two-step MF technique was approximately 1.5 times that observed using the M-Endo, one-step MF procedure. Fecal coliform recovery using the M-FC MF technique on chlorinated effluent was less than that obtained using confirmed MPN in EC broth. Estimates of MPN densities in chlorinated secondary effluent might be useful from currently acceptable MF procedures by using a mathemati-cal relationship similar to log MPN equals to 1.062 log MF minus 0.014. (Little-Battelle) W73-11002

EDAPHIC FACTORS OVERRIDE A POSSIBLE GRADIENT OF ECOLOGICAL MATURITY IN-DICES IN A SMALL STREAM, North Carolina Univ., Chapel Hill. Dept. of

Botany. A. F. Motten, and C. A. S. Hall. Limnology and Oceanography, Vol 17, No 6, p 922-926, November 1972. 2 fig, 20 ref. OWRR B-

Descriptors: "Trophic level, "Respiration, "Primary productivity, "Pigments, Ecology, Dissolved oxygen, Spectrophotometry, Separation techniques, Benthos, "North Carolina. Identifiers: Sample preparation, *New Hope Creek (NC). *Edaphic factors.

The objective was to apply Margalel's (1963, 1963) maturity indices to two regions of New Hope Creek, North Carolina to test the hypothesis that Creek, North Carolina to test the hypothesis that upstream regions are less ecologically mature than downstream regions. Two parameters were measured at three locations in the streams: pigment ratios, or the ratios of the optical densities at 430 and 665 millimicrons, and the ratio of gross productivity to community respiration (P:R). Oxygen was measured by both the Winkler method and a galvanic probe recorder. Pigment analyses were based on random samples of benthic communities. These samples were centrituged, ground in acctone, and the absorbance of the extracted pigment read on a spectrophotometer. Within the limited scope of this study no support was found for the original proposition that the upstream region of the stream was less ecologically mature than the downstream region. If differences in ecological maturity do exist between the two sites studied, they are not properly measured by pig-ment ratios or P:R ratios, or, more probably, they are overridden by local or edaphic factors. (Little-Battelle)

A PRELIMINARY INVESTIGATION OF OR-GANIC-INORGANIC ASSOCIATIONS IN A STAGNATING SYSTEM, Georgia Univ., Athens. Dept. of Zoology. For primary bibliographic entry see Field 05B. W73-11004

PHYTOPLANKTON OBSERVATIONS IN THE EASTERN CARIBBEAN SEA, Old Dominion University, Norfolk, Va. Dept. of

Biology. H. G. Marshall.

Hydrobiologia, Vol 41, No 1, p 45-55, February 28, 1973, 1 fig. 3 tab. 9 ref.

Descriptors: *Marine algae, *Phytoplankton, Nannoplankton, Chrysophyta, Cyanophyta, Pyrrophyta, Ecological distribution, Dominant organisms, Diatoms, Nansen bottles, Hydrography,
Water sampling, Dinoflagellates, Water temperature, Dissolved oxygen, Depth.
Identifiers: *Caribbean Sea, Silicoflagellates, Coccolithophores, Species diversity, Flagellates, Sample preservation, Amphiprora, Amphora,
Caloneis, Cocconeis, Diploneis, Fragilaria, Pleurosigma, Amphidinium, Gonyaulax, Phalacroma,
Asterolampra marylandica, Bacteriastrum
comosum, Biddulphia mobiliensis, Cerataulina
pelagica, Chaetoceros species, Coscinodiscus species.

In order to obtain phytoplankton and hydrographic data, water samples were taken at 11 sites along transects in Caribbean Sea on two different cruises, January 1969 and January 1970, west of the Lesser Antilles. Another series of collections were made off the coast of Venezuela (January 1968). A total of 88 taxa were noted in these samples, of which there were 44 diatoms, 41 pyrrhophyceans, 2 cyanophyceans and 1 silicoflagel-late. Totals of 37 and 38 different phytoplankters were observed during cruises E46K-67-68 and E1-C70, respectively, with 58 species noted in the extensive samplings of E 50D-68-69. A diatomaceaous flora predominated in each series of collections. The phytoflagellates were well represented, but in low numbers. The overall phytoplankton concentrations were low for each of the areas studied during these three January cruises. Even the concentrations were low for each of the areas studied during these three January cruises. Even the preliminary data on the coccolithophore concentration do not indicate a major development at this time of the year. The present results indicate a substantial contribution made by the nannoplankton. In this series of January collections they consisted predominately of the diatom Melosira sp. In these offshore waters various species of the genus Rhizosolenia were most abundant. Only one bloom condition was noted and this consisted of Noctiluca scintillans. There were 13 phytoplank-ters found during each of the three cruises, having a distribution that extended over the eastern a distribution that extended over the eastern Caribbean. These were the diatoms, Coscinodiscus sp., Rhizosolenia alata, R. hebetata semispina, Navicula sp., Thalassiothrix frauenfeldii, Pieurosigma sp., and the pyrrohophyceans, Ceratium fusus, C. trichoceros, C. tripos, Podolampas spinifera. These were in addition to Dictyocha fibula, Skujaella thiebantii, and Richelia intracellularis. (Holoman-Battelle) W73-11006

GROWTH OF A FLOATING AQUATIC WEED, SALVINIA UNDER STANDARD CONDITIONS, Makerere Univ., Kampala (Uganda). Dept. of

For primary bibliographic entry see Field 05C.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION **Group 5A—Identification of Pollutants**

ZOOGLOEA BACTERIUM WITH
ATINOUS MUCOPOLYSACCHARIDE GELATINOUS MATRIX, Tokyo Metropolitan Univ. (Japan). Dept. of Biolo-

Y. Tezuka. Journal Water Pollution Control Federation, Vol 45, No 3, p 531-536, March 1973. 2 fig, 2 tab, 26

Descriptors: "Pollutant identification, "Cultures, "Separation techniques, "Activated sludge, Syste-matics, Chromatography. Identifiers: "Zoogloes, Culture media, Paper chro-matography, Characterization, Amino sugars, N-acetylglucosamine, N-acetylflucosamine.

A zoogloea-forming bacterium was isolated from activated sludge and identified tentatively as belonging to the genus Zoogloea. The bacterium grew in liquid media with the formation of amorphous gelatinous colonies in which the bacterial cells were sparsely embedded. The gelatinous substance was isolated and purified partially: it was a mucopolysaccharide composed primarily of two amino sugars. One of these sugars was identified as N-acetylglucosamine, and the other was suggested to be N-acetylfucosamine. The molar ratio of the former to the latter was approximately 1:2. The polymer was quite resistant to the action of the microfloras from wastewater and soil. (Little-Battelle)

PHAGE-TYPING OF STAPHYLOCOCCUS AU-

REUS, Central Public Health Lab., London (England).

M. T. Parker. In: Methods in Microbiology, Vol 7B, Academic Press, New York. 1972. p 2-28, 2 fig, 4 tab, 51 ref.

Descriptors: "Separation techniques, "Pollutant identification, Cultures, Methodology, Laboratory equipment, "Systematics, "Bacteriophage." 'Phage typing, Data interpretation, Culture media, "Staphylococcus aureus, Phages.

This chapter of 'Methods in Microbiology' discusses the historical development and present technical methods of phage typing as a means of distinguishing Staphylococcus aureus, interpretation of results from phage typing, staphylococci from domestic animals, taxonomic significance of phage typing, and the future potential of the method. The section on technical methods thoroughly reviews the media and conditions of growth, propagation and testing of phages, typing, and reading and reporting of results. The section on interpretation discusses the range and causes of variability and long-term changes in typing patterns. (Little-Battelle) W73-11012

DETECTORS FOR WATER POLLUTION. MEASUREMENT OF

Process Biochemistry, Vol 8, No 3, p 31-33, March

Descriptors: *Measurement, *Water pollution, *Monitoring, *Instrumentation, Methodology, Automatic control, Pollutant identification, Water tomatic control, Pollutant identification, Water quality control, Automation, Turbidity, Cations, Anions, Hardness (Water), Sodium, Hydrogen, Potassium, Nitrates, Calcium, Fluorides, Chlorides, Bromides, Iodides, Sulfur, Cadmium, Lead, Sulfates, Ion exchange. Identifiers: "Detectors, "Sensors, Ion selective electrodes, Membrane electrodes, Ammonia electrodes, Detection limits, Chemical interference, Ionic interference, Borotetra-fluorides, Cyanides, Perchlorates, Silver, Thiocyanates, Ion exchange electrodes, Organic carbon.

A symposium was held in January at the Electronics Division of the Institution of Electrical Engineers. Papers presented by representatives from instrument companies, the Water Resources Board, the Department of the Environment, the Water Research Association and River Authorities: covered the following topics or areas of interest: (1) 'Improvements to the Organic Carbon Monitor', (2) 'Recent Developments in Sensors and Systems for Monitoring Water Quality', (3) 'The Application of Gas Permeable and Selective Ion Electrodes to Continuous Water Quality Monitoring', (4) 'The Use of an Ammonia-Sensitive Membrane Electrode', (5) Application of Atmospheric Turbidity Monitoring Techniques to Water Turbidity Monitoring', (6) 'Automatic Monitoring of River Water Quality, (7) 'Some Operational Problems Associated with River Water Quality Monitoring', (8) 'Practical Experiences in River Water Quality Monitoring'. W73-11016

TOXICITY, RESIDUE DYNAMICS, AND REPRODUCTIVE EFFECTS OF PHTHALATE ESTERS IN AQUATIC INVERTEBRATES, Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab. For primary bibliographic entry see Field 05C. W73-11020

SOME TRACE ELEMENT CONCENTRATION VARIATIONS OBSERVED IN MARINE ORGANISMS THAT SUGGEST CAUTION IN GANISMS THAT SUGGEST CAUTION IN SAMPLING,
Scripps Institution of Oceanography, La Jolla, Calif. Soledad Marine Radioactivity Lab.
T. R. Folsom, V. F. Hodge, K. M. Wong, R. Kishore, and V. P. Guinn.

Report No. TID-26198, May 24-26, 1972. 14 p, 1

fig, 8 tab, 1 ref.

Descriptors: *Bioindicators, *Mercury, *Zinc, *Lead, Heavy metals, *Marine fish, *Trace elements, Invertebrates, Kelps, Marine algae, Clams, Mollusks, Snails.

Identifiers: *Data interpertation, *Selenium, *Bioaccumulation, Albacore tuna, Dolphins, Polonium, Scandium, Horse clam, Bubble snail, Turban snail, Sea hare, Skipjack tuna, Elk kelp, Biological samples, Maccroinvertebrates, Pb-210, Po-210, Pelagohycus porra, Spleen, Kidneys, Tail fin, Liver, Bone, Gills, Heart, Stomach contents, Brain, Flesh, Muscle, Skin, Gall bladder, Eyes, Thunnus alalunga, Katsuwonus pelamis, Blood, Norrisia norrisi, Bulla gouldiana, Tresus nuttallii, Aplysia californica, Ovaries, Testes, Spermalotheca, Body fluids, Genital duct.

Data were accumulated on accumulations of Hg, Se, Zn, Pb, Pb-210, and Po-210 in elk kelp, Zn, Se, and Po-210 in a bacore, Po-210 in skipjack, Po-210, Pb-210, Hg, Se, and Zn in dolphins, and Po-210 in horse clams, bubble snails, brown turban snails and sea hares. Analysis of these data shows that concentrations of metals vary greatly from one organ to another. If whole-body residues or residues in organs not specific for certain elements one organ to another. If whole-body residues or residues in organs not specific for certain elements are measured, errors much larger than those from analytical procedure may result. Consequently, it is only possible to draw valid conclusions from data which have been obtained with normal, averaged, or otherwise standardized conditions. (Little-Battelle) W73-11021

FAST LIQUID CHROMATOGRAPHY. Kyoto Univ. (Japan). Faculty of Science. Research/Development, Vol 24, No 4, p 28-32, April 1973. 11 fig, 14 ref.

Descriptors: *Instrumentation, *Laboratory equipment, Research equipment, *Organic compounds, *Automatic control, *Chemical analysis,

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*Pollutant identification, Amino acids, Automation, Separation techniques, Selectivity, Aromatic compounds, *Chromatography.
Identifiers: High speed liquid chromatography, Spectrophotofluorimeter, Automatic amino acid analyzer, Ultraviolet absorption detector, Differential refractometric detector, Flow spectrophotofluorimetric detector, Gel permeation chromatography, Spectrophotometric detector, Biological samples, Sensitivity, Liquid chromatography, Hitachi 634 liquid chromatograph, Chrysene, Phenathrene, Pyrene, Triphenylene, Chrysene, 1 2-Benzanthracene, 1 2-Benzanthracene, 1 2-Benzanthracene, 1 2-Benzanthroene, Benzothiophene, Dibenzothiophene, Chromatographic columns.

Instrumentation developed in Japan is described, including the latest chromatographs and detectors available. The specific equipment is: (1) an automatic liquid chromatograph, consisting of a chromatographic separation system which utilizes an automatic fractionation mode, a two-wavelength in the processor of t matographic separation system which utilizes an automatic fractionation mode, a two-wavelength spectrophotometric detector, and an automatic operation system; (2) an automatic amino acid analyzer equipped with three constant-flow delivery pumps and a three-wavelength flow photometric detector in continuouus flowing mode; (3) an automatic liquid chromatograph equipped with a three-wavelength flow-spectrophotometric detector selective to wavelengths of 200 and 750 nm; (4) a high speed liquid chromatograph equipped with a differential refractometer operating on Fresnell's principle; and (5) the FLC-1 fast chromatograph equipped with a flow spectrophotofluorimeter. The ultraviolet absorption, differential refractometric, and flow spectrophotofluorimeter detectors have been used with this equipment. Histoch KLA-5 amino acid analyzers have been used for accelerated analyses of amiono acids and related ninhydrin compounds. The Hitachi 634 liquid chromatograph has been used for other organic and biological compounds. (Holoman-Battelle) W73-11022

DETECTION OF ORGANO-PHOSPHORUS PESTICIDE RESIDUES IN AUTOPSY TISSUES BY THIN-LAYER CHROMATOGRAPHY, Chemical Examiner's Lab., Agra (India) Toxicolo-

gy Div. S. N. Tewari, and S. P. Harplani. Mikrochimica Acta, Vol 2, p 321-324, March 1973. 1 tab, 23 ref.

Descriptors: *Separation techniques, *Solvents, *Diazinon, Pesticides, *Pesticide residues, Phenols, Pollutant identification, Organophosphorus pesticides, Phosphothioate pesti-

ganophosphorus pesticides, "Phosphotholate pesti-cides, "Chromatography thromatography, "Liver, Identifiers: "Thin layer chromatography, "Liver, "Sample preparation, Ethyl parathion, Methyl parathion, Meta-systox, p-Nitrophenol, Tissue, Biological samples, Organic solvents, Benzene, Malathion, Nitrophenol.

A method of extracting organophosphorus pesticides from postmortem human tissues (liver), and their separation and identification by thin-layer chromatography are described. The respective metabolites are also separated. The insecticides used as controls were: ethyl parathion, methyl parathion, malathion, diazinon and meta-systox. The liver sample was extracted by homogenizing with analystops sodium sulfate and redistilled with anhydrous sodium sulfate and redistilled with anhydrous sodium suitate and redistuled actione, filtering, evaporating the solution, extracting the residue with n-hexane, and partitioning with acetonitrile. After evaporation of the acetonitrile layer, the residue was dissolved in ethanol for spotting on thin layer plates. Four solvent systems were evaluated: cyclohexane-acetone (40:5 and 40:15), cyclohexane-ethylmethyl ketone (40:1), and benzene. Benzene was suitable for separation of ethyl parathion, methyl parathion, malathion, diazinon and meta-systox on silica gel thin layers. Rhodamine B was used as the detection reagent. Other solvents were superior for separation of mixtures of metabolites of some of these pesticides. (Little-Battelle)

TRACING OIL AS A POLLUTANT IN WATER, Environmental Protection Agency, Redmond, Wash, Regional Lab.

wash. Regional Lab. N. J. Malueg, and D. F. Krawczyk. Journal of Petroleum Technology, Vol 25, p 243-248, March 1973. 1 fig, 9 tab, 16 ref.

Descriptors: *Tracking techniques, *Oil spills, Water pollution sources, *Pollutant identification, Methodology, *Water analysis, Oil pollution, Oily water, Gas chromatography, Sulfur, Chemical analysis, Iron, Nickel, Zinc, Heavy metals, Solumet attractions, Sensestion a Schargetions. vent extractions, Separation techniques. Identifiers: *Oil characterization, *Oil fingerprintineminters: 'Out characterization,' On integripming, Sample preparation, Petroleum products, Chemical recovery, Chemical composition, Precision, Fuel oil, Infrared scans, Lube oil, Vanadium, Atomic absorption, Crude oil, Diesel oil, Oil types, Organic solvents, Paper strip method, Bunker fuel oil, Medium oil, Light oil.

An approach used to trace an oil or a petroleum An approach used to trace an on or a petroleum product found in or on water to a source is delineated. Sample preparation involves extracting a volume of the sample with a solvent, rinsing with distilled water to form an emulsion, and extracting with additional solvent. The solvent is filtered and removed completely by passing clean, dry nitrogen over the solvent-oil mixture in a hot water bath. The oil is then dessicated so that further bath. The oil is then dessicated so that further analysis can proceed. The paper strip and gas chromatographic methods are used for comparing a source with a spill and the chromatographic fluorescence method is used for comparing sam-ples of petroleum products. Infrared scans are used to compare oily water with potential sources. Sulfur and metallic techniques are used to deter-mine sulfur and metal content. All the data col-lected are compared with data on crude and are compared with data on crude as refined products and some judgment can be made as to whether the sample is a crude or refined product and on the locality of the original crude. The 'fingerprints' of the oil can then be compared with possible sources. (Holoman-Battelle) W73-11024

MICROBIAL COMMUNITY STRUCTURE IN CONTAMINATED ESTUARIAN SEDIMENTS, North Texas State Univ., Denton. For primary bibliographic entry see Field 05C. W73-11025

DIFFERENTIATION OF SOME ENTEROCOCCI BY GAS CHROMATOGRAPHY Iowa State Univ., Ames. Dept. of Bacteriology. C. F. Amstein, and P. A. Hartman. Journal of Bacteriology, Vol 113, No 1, p 38-41, January 1973. 1 fig, 2 tab, 21 ref.

Descriptors: *Pollutant identification, *Gas chromatography, *Streptococcus, *Separation Descriptors: "rotutant necessary." Separation techniques, Bioindicators, Enteric bacteria, Water pollution sources, Cultures. Identifiers: "Fatty acids, Streptococcus faecium Streptococcus faecium var. durans, Streptococcus faecium var. casseliflavus, Sample preparation, Culture media.

If enterococci are to be useful as indicators of fecal pollution in foods, it will be necessary to dif-ferentiate fecal and non-fecal types. A method was attempted which involved determining relative atty acid compositions of 37 enterococci by gas chromatography. Streptococcus faecalis, Streptococcus faecium, and Streptococcus faecium var. casseliflavus, and a motile yellow-pig-mented streptococcus, contained very low levels of C sub 19:0 cyclopropane fatty acid and four unidentified components, compared to the other strains of enterococci examined. The studies clarified the relationships between existing species and use relationships between existing species and varieties, but showed no significant differences in the fatty acid patterns of enterococci grouped according to plant, animal, or human source. (Little-Battelle)
W73-11027

THE DETERMINATION OF TRACE METALS AND THEIR SIGNIFICANCE IN CLINICAL CHEMISTRY, Hospital for Sick Children, London (England).

Atomic Absorption Newsletter, Vol 12, No 2, p 50-54, March-April 1973. 4 fig, 3 tab, 26 ref.

Descriptors: "Copper, "Lead, "Zinc, Cadmium, Manganese, Cobalt, Iron, Nickel, Heavy metals, "Trace elements, "Metals. Identifiers: "Blood, "Plasma, Sample preparation, "Atomic absorption spectrophotometry, Flame microsampling, Furnace atomization, Sensitivity, Precision, Delves cup method, Flameless atomic absorption spectrophotometry, Ashing.

Because of the relationship of both essential and non-essential trace metals to human health and environmental conditions, analysis of trace metals in vironmental conditions, analysis of trace metals in tissue, blood, urine, and plasma is important. Work is reviewed in developing methods or analyzing lead in blood and urine, copper in plasma, and copper and zinc in plasma protein fractions. Difficulties with flame AA analysis of lead in blood and urine have been overcome by using flame-assisted microsampling techniques or furnace atomization techniques. Flame microsampling has also been used to determine copper in plasma. Furnace atomization has proven useful for determining less volatile metals and has been used to investing the consecutations in to investigate copper and zinc concentrations in plasma fractions. The sensitivity and precision of this technique are given for Zn, Cd, Mn, Pb, Cu, Co, Fe, and Ni. (Little-Battelle)

TRACE ELEMENT DETERMINATION WITH SEMICONDUCTOR DETECTOR X-RAY SPEC-TROMETERS, California Univ., Berkeley. Lawrence Berkeley

R. D. Giauque, F. S. Goulding, J. M. Jaklevic, and R. H. Pehl.

Analytical Chemistry, Vol 45, No 4, p 671-681, April 1973. 17 fig, 6 tab, 20 ref.

Descriptors: *X-ray spectroscopy, Air, *Aqueous solutions, Separation techniques, *Heavy metals, Rocks, Chromium, Manganese, Iron, Nickel, Copper, Zinc, Bromine, Strontium, Lead, Potassium, Calcium, Titanium, Absorption, Air pollution, Calibrations, Laboratory equipment, *Trace ele-

Heuns, Identifiers: Blood, Sample preparation, Orchard leaves, "Semiconductor detector, Detection limits, Biological samples, Freeze drying, Arsenic, Rubidium, Vanadium, Gallium, Selenium, Tissue, Sensitivity.

A method of obtaining high sensitivity and accuracy in X-ray fluorescence analysis using semiconductor detector spectrometers is discussed. Monoenergetic exciting radiation is employed to generate characteristic X-rays from trace elements in thin, uniform specimens. Corrections for absorption effects are determined; enhancement effects are omitted as they are negligible for many thin specimens. A single element thin-film standard is used to calibrate for the X-ray geometry, and theoretical cross sections and fluorescent yield data are employed to relate the X-ray yields for a wide range of elements to the thin-film standard. Various corrections which affect the accuracy of the method are discussed including the method for determining X-ray spectral background. Samples of orchard leaves, tissue, blood, and other biological materials are prepared for analysis by freeze- or oven-drying, pulverizing, and pressing into pellets. Rock, glass, and pottery specimens are prepared by pulverizing, collecting on thin filters, and transferring the dust to Millipore filters. Elements in solution are absorbed on cellulose powder, dried, pulverized, and pressed into pellets. Elements in air can be analyzed directly from filter papers. Samples of orchard leaves, rocks, pottery, and air particulate filters were analyzed for metals including Cr, Mn, Fe, Ni, Cu, Zn, As, Br, Rb, Sr, Pb, K, Ca, Ti, V, Ga, and Se. Using a single excitation energy, the concentrations of more than fifteen trace elements may be simultaneously determined during a fifteen-minute interval for concentrations of 1 ppm or less. (Little-Battelle)

SEPARATION AND CHARACTERIZATION OF DIMETHYLNITROBIPHENYL AND DIMETHYLBIPHENYLAMINE ISOMERS BY CHROMATOGRAPHIC AND SPECTROMET-RIC METHODS, Baylor Coll. of Medicine, Houston, Tex. Inst. for

Daylor Cut. of medicine, riouson, 122. Inst. to Lipid Research. P. A. Dudley, M. W. Noall, and D. M. Desiderio. Analytical Chemistry, Vol 45, No 4, p 703-706, April 1973. 4 fig. 12 ref.

Descriptors: *Separation techniques, *Infrared radiation, *Ultraviolet radiation. Identifiers: Characterization, *GC-mass spectrometry, *Sample preparation, *Isomers, Dimethylbiphenyls, Dimethylbiphenylamines, Infrared spectra, Ultraviolet spectra, Partitioning, Chromatograms, 2' 3-Dimethyl-4-nitrobiphenyl, 3 3'-Dimethyl-4-biphenylamine, 2' 3-Dimethyl-4-biphenylamine, 3' 3-Dimethyl-4-biphenylamine, 3

biphenylamine, 2' 3-Dimethylbiphenyl.

Diazotized 4-nitro-m-toluidine when coupled with toluene yields a mixture of dimethyl positional isomers of 2'-3'-, or 4'dimethyl-4-nitrobiphenyl. The 2',3-dimethyl-4-nitrobiphenyl isomer is of interest as a precursor for the carcinogen 2',3-dimethyl-4-diphenylamine and the related hyroxamic acid. The 2',3-dimethyl-4-nitro isomer is separated on a preparative scale from the 3,3'- and 3,4'-dimethyl isomers in a cyclohexane-heptanenitromethane liquid-liquid partition chromatography system. The chromatographic system resolved 2',3-dimethyl-4-biphenylamine isomers and from the nitro compounds. The 2',3-dimethylnitro or amine isomers may be analyzed by GLC on a 4-mm x 5-foot column of 2 percent OV-17 on Gas Chrom P. The methyl positional isomers of the nitro and amine compounds and their corresponding hydrocarbons have been characterized and compared to reference hydrocarbons by mass spectrometry. The 2',3-dimethyl nitro and amine compounds are additionally characterized by physical constants, IR, and UV spectral data. (Little-Battelle) W73-11032

TRACE ELEMENT ANALYSIS IN WATER BY

PROTON ACTIVATION, California Univ., Davis. Dept. of Applied Science. S. F. Bankert, S. D. Bloom, and G. D. Sauter. Analytical Chemistry, Vol 45, No 4, p 692-697, April 1973. 9 fig, 3 tab, 6 ref.

Descriptors: *Water analysis, Nitrogen, Bromine, Boron, Cadmium, Chromium, Sodium, Evaporation, Calibrations, Instrumentation, Laboratory equipment, *Trace elements. Identifiers: *Sample preparation, *Proton activation analysis, Selenium, Detection limits, Sentiticity.

Group 5A—Identification of Pollutants

Charged particle activation analysis (CPAA) has been applied to the measurement of trace amounts of pollutants in calibrated water samples. The activating particles are 14.7 MeV protons in a microampere (or less) beam from the Lawrence Livermore Laboratory 30-inch cyclotron. The short half-live gamma spectrum of the activated sample is assayed in a Nal-Ge (Li) anticoincidence detector system. A fast transit system carries the sample is assayed in a Nal-Ge (Li) anticoincidence detector system. A fast transit system carries the sample from the bombardment site to the counting position in about 1.8 seconds. As of now, the technique is capable of simultaneously detecting ppm quantities of boron, nitrogen, bromine, selenium, sodium, cadmium, and chromium in concentrated water samples evaporated to dryness on tantalum foils. However, it is applicable to any thin sample which can be fixed to a foil. (Little-Rattelle) Battelle) W73-11033

ON-THE-FLY GAS CHROMATOGRAPHY-I-NEBARED SPECTROMETRY HISING CHOLESTERIC LIQUID CRYSTAL-EFFLUENT

Hunter Coll., New York. Dept. of Chemistry.
J. O. Lephardt, and B. J. Bulkin.
Analytical Chemistry, Vol 45, No 4, p 706-710,
April 1973. 9 fig, 4 ref.

Descriptors: *Gas chromatography, *Organic compounds, Pollutant identification. Toluene, Chi Carbon Chloroform, Identifiers: dichloroethane, tetrachloride. dicanoroethane, Caroon tetrachordee, Nitrobenzene, m-Chloroaniine, o-Toluidine, p-Chloroaniine, N N-dimethylaniine, *GC-Infrared spectrometry, Infrared spectra, Cholesteric liquid crystals, On-the-fly gas chromatography.

A GCIR system is described which combines the features of trapping and on-the-fly techniques. The heart of the system is a cholesteric liquid The neart of the system is a cholesteric fiquid crystal film. The system was used to obtain infrared spectra of toluene, chloroform, 1,2-dichloroethane, carbon tetrachloride, ontrobenzene, m-chloroaniline, o-toluidine, o-chloroaniline, and n,n-dimethylaniline. On-the-fly IR spectra of organic vapors can be obtained with quantities as small as 50 micrograms. The liquid crystal fractionates sample from carrier gas. The technique yields spectra which are solution rather than gas phase spectra, eliminating problems of rotational structure and vapor-liquid frequency shifts. The system can also be used for on-the-fly spectra of organic vapors in an air stream, with comparable efficiency. Color shifts occurring on adsorption and desorption of the effluents onto the liquid crystal film can be monitored to trigger in-frared scanning and eliminate delay time errors associated with gas cell operation. The range of the system can be extended by changing the carrier gas to effluent ratio for high boiling materials. (Lit-tle-Battelle)

GAS CHROMATOGRAPHIC SEPARATION, BY CARBON NUMBER AND HYDROCARBON TYPE, OF SATURATED HYDROCARBON MIX-TURES AND DIFFERENT NAPHTHAS OVER MOLECULAR SIEVES 13X, Settore Laboratori Chimici, Syracuse (Italy).

ROLLECTIAN SIEVES 193. Settore Laboratori Chimici, Syracuse (Italy). F. Garilli, L. Fabiani, U. Filia, and V. Cusi. Journal of Chromatography, Vol 77, No 1, p 3-10, March 14, 1973. 3 fig, 8 tab, 2 ref.

Descriptors: Methodology, *Separation techniques, *Molecular structure, Chemical analysis, Pollutant identification, *Gas chromatog-Methodology,

ats, Fullular Taphy.
Identifiers: "Flame ionization gas chromatography, "Gas solid chromatography, "Naphtha, Mixtures, "Aliphatic hydrocarbons, Oil types, Aromatic hydrocarbons, Molecular sieves, Crude oil, n-Paraffins, Naphthenes, iso-Paraffins, n-Butane, n-Pentane, Propane, n-Hexane, n-Heptane, n-Octane, n-Nonane, Toluene, Xylene, n-Decane,

3-Dimethylbutane, Methyl-Cyclohexane, 2 3-Dimethylbutane, Methylcyclohexane, 3-Methylhexane, 2-Dimethylcyclohexane, 3-Methylheptane, 1 3 5-Trimethylcyclohexane, 4-Methyloctane.

A gas-solid chromatographic method is described for separating hydrocarbon mixtures according to hydrocarbon type and carbon number by the use of molecular sieves 13X. Practical applications of this analytical method are reported, including the analysis of the charge and the end-products of a platforming plant, and in addition, some quantitative and qualitative determinations on virgin analytic from different types of crude oil naphtha from different types of crude oil. (Holoman-Battelle) W73-11035

THE USE OF GAS-LIQUID CHROMATOG-RAPHY FOR SELECTING EXTRACTIVE SOI VENTS FOR LIQUID EXTRA PROCESSES, Z. I. Abramovich, M. F. Bondarenko, E. A.

Kruglov, R. M. Masagutov, and M. A. Pais. Journal of Chromatography, Vol 77, No 1, p 37-40, March 14, 1973. 1 tab, 10 ref.

Descriptors: *Solvent extractions, *Selectivity, *Separation techniques, Phenols, Alcohols, Nitrogen compounds, Sulfur compounds, Organic

ntifiers: *Gas liquid chromatography, *Organic Identifiers: "Gas liquid chromatography, "Organic solvents, Esters, Aromatic hydrocarbons, Thiophane, o-Cresol, Diisopropyl sulfide, n-Oc-tane, 2-Methyl thiophene, Toluene, Kerosene, Gas oil, m-Cresol, p-Cresol, o-Chlorophenol, Ethylene glycol, Triethylene glycol, Benzyl al-cohol, Furfuryl alcohol, Propylene carbonate, Dimethyl malonate, Diethyl oxalate, Diisopropyl sulcates, Ecomomide Mythyl carbonate, Asilina Differential mananet, Discord To Adaler, Dissophopy malonate, Formamide, Ethyl carbamate, Aniline, Dimethylaniline, Nitrobenzene, Benzonitrile, 1-Nitro-2-methylpropanol-2, N-Methylpyrrolidone, Dimethyl sulfoxide, Sulpholane, Acetylthiophene, Furfural, Maleic anhydride, n-Tetradecane, alpha-Methylnaphthalene.

Gas-liquid chromatography has been used to investigate the group selectivity of 28 solvents in the separation of cyclic and aliphatic sulfides from the hydrocarbons. The solvents containing -OH and -NH2 groups were the most selective in separating the cyclic sulfides and monocyclic aromatic hydrocarbons. The data obtained allowed an extractive solvent (phenol) to be chosen for separa ing the cyclic sulfides from the kerosene-gas-c fractions. With the straight-run petroleum fraction 275-350 degrees the possibility of obtaining the sulfide concentrates with the help of liquid extraction was experimentally confirmed. (Holoman-Bat-W73-11036

COMPARISON OF FLAME AND FLAMELESS

ATOMIC ABSORPTION FOR THE DETER-MINATION OF CALCIUM, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 02K. W73-11037

SOME OBSERVATIONS ON STANDARD MERCURY SOLUTIONS FOR ATOMIC ASBORP-

TION SPECTROSCOPY,
Tohoku Univ., Sendai (Japan). Dept. of Applied

Chemistry. T. Odashima, and Y. Kumagai. Atomic Absorption Newsletter, Vol 12, No 2, p 39, March-April 1973. 2 fig, 2 ref.

Descriptors: *Mercury, Heavy metals, Absorption, Pollutant identification.

Identifiers: *Atomic absorption spec-trophotometry, *Standard solutions, *Mercury nitrate, *Mercury chloride, Chemical interference.

Measurements made with a Hitachi Model 207 Measurements made with a fruitern model 20/ atomic absorption spectrometer showed that the atomic absorption of mercury at 254 nm in air-acetylene flames is greatly influenced by certain types of standard mercury (II) solutions. When mercury (II) chloride was used for standard solutions, rectangular absorption peaks were obtained, but when mercury (II) nitrate was used, there was but when mercuy (11) mirate was used, there was tailing of the peaks. The tailing effect can be eliminated by adding sufficient quantities of ha-lides such as KCl, KBr, KSCN, or KI. (Little-Bat-W73-11038

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THE APPLICATION OF FLAMELESS ATOMIC ABSORPTION IN HYDROGENOCHEMICAL

ANALYSIS, Institute of Geological Sciences, London (England). Dept. of Hydrogeology. For primary bibliographic entry see Field 02K. W73-11039

SELECTIVE DETERMINATION OF HETERO-ORGANICS BY A DUAL-CHANNEL DETECTOR BASED ON FLAME CONDUCTIVITY AND

Missouri Univ., Columbia, Dept. of Agricultural

massour Univ., columnas. Dept. of Agricultura Chemistry. W. A. Aue, and H. H. Hill, Jr. Analytical Chemistry, Vol 45, No 4, p 729-732, April 1973. 2 fig. 1 tab, 5 ref.

Descriptors: Iron, Lead, Tin, *Phosphorus, *Suldescriptors: ron, Lead, Im, Priosphotus, Sur-fur, *Carbon, *Gas chromatography, Laboratory equipment, *Metals. Identifiers: *Flame ionization detector, Detection

limits, Dodecane, Trimethylphosphate, Dia-butyl-disulfide, Tetraethyl lead, Tetraethyl tin, Ferrocene, Biological samples, Environmental

A simple dual-channel detector was constructed from a regular FID and a spectrometer and used to study ionization and emission processes occurring in hydrogen flames. The response of the system was tested with dodecane, trimethyl-phosp di-n-butyl-disulfide, tetraethyl lead, tetraethyl tin and ferrocene under air-rich and hydrogen-rich conditions. The results showed that both emission d ionization responses can be used to determine the metals in the nanogram and picogram ranges, respectively; while the response to carbon is repressed by several orders of magnitude. The method should prove useful for biological and en-vironmental samples. (Little-Battelle) W73-11040

A NEW MODEL FOR THE RESPONSE OF A CYANIDE SELECTIVE SILVER IODIDE MEM-BRANE ELECTRODE, Imperial Coll. of Science and Technology, London

(England). Dept. of Chemistry. G. P. Bound, B. Fleet, H. von Storp, and D. H.

Analytical Chemistry, Vol 45, No 4, p 788-789, April 1973. 2 fig, 1 tab, 10 ref.

Descriptors: Electrodes. Identifiers: *Ion selective electrodes, *Cyanides, *Selectivity, Membrane electrodes.

Selectivity data are presented for a pure AgI membrane in a mercury-mercuric chloride test cell. K values were calculated from results obtained with individual solutions and with solutions containing a constant level of iodide to which varying concentrations of cyanide were added. A model describes the behavior of the electrodes and accounts for the differences in K values obtained with the two solutions. (Little-Battelle)

A PENICILLIN SELECTIVE ENZYME ELEC-TRODE, Wyeth Labs., Inc., Philadelphia, Pa. Analytical and Physical Chemistry Section. G. J. Papariello, A. K. Mukherji, and C. M.

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Shearer. Analytical Chemistry, Vol 45, No 4, p 790-792, April 1973. 2 fig, 2 tab, 13 ref.

Descriptors: "Fabrication, Physical properties, "Aqueous solutions, "Selectivity, "Electrodes, Research equipment, Pollutant identification, Antibiotics (Pesticides), Chemical reactions, Methodology, Laboratory equipment, Bactericides, Hydrogen ion concentration, Enzymes, Temperature.

Identifiers: *Penicillinase, Enzyme electrodes, Penicillin, *Penicillin enzyme electrode, Membrane electrodes, Substrate concentration, Detection brane electrodes, Substrate Concentration, Detec-tion limits, Response time, Specificity, Sodium ampicillin, Sodium nafcillin monohydrate, Potassium penicillin G, Potassium penicillin V, Potassium cyclicillin, Sodium dicloxacillin monohydrate, Drugs, Penicilloic acid, Ion selective electrodes.

An enzyme electrode has been developed which utilizes penicillin beta-lactamase (penicillinase) and is responsive to intact penicillin. The electrode is prepared by immobilizing the penicillinase in a thin membrane of polyactylamide gel molded around and in intimate contact with a hydrogen ion glass electrode. When this electrode is exposed to around and in intimate contact with a hydrogen ion glass electrode. When this electrode is exposed to an aqueous solution of penicillin adjusted to a pH of 6.4, and immobilized enzyme hydrolyzes He penicillin to produce the corresponding penicilloic acid. The increase in hydrogen ion concentration from the penicillioic acid is sensed by the glass electrode and a potentiometric response is recorded. This electrode is analytically useful in the penicillin concentration range of 0.0001-0.05 M. The response time is dependent upon the age of the electrode, with the typical response time being 15-30 sec. pH affects the solubility and stability of penicillin, and the reactivity of penicillinase. The electrode was most sensitive and responsive at pH 6-7. If the electrode is prepared as recommended, (1) there is enough penicillinase to react with more than 0.5 mole of a penicillin; and (2) the electrode will function in an acceptable manner for up to 2 weeks making possible a hundred or more measurements. (Holoman-Battelle) W73-11042

X-RAY MICRODETERMINATION OF CHROMIUM, COBALT, COPPER, MERCURY, NICKEL, AND ZINC IN WATER USING ELEC-TROCHEMICAL PRECONCENTRATON, Seton Hall Univ., South Orange, N.J. Dept. of

Chemistry.

B. H. Vassos, R. F. Hirsch, and H. Letterman.

Analytical Chemistry, Vol 45, No 4, p 792-794,

April 1973. 2 fig, 1 tab, 11 ref.

Descriptors: *X-ray fluorescence, *Aqueous solutions, *Water analysis, Copper, Mercury, Zinc, Nickel, Cobalt, Chromium, Separation techniques, *Heavy metals, Electrodes.

Identifiers: *Electrodeposition, *Sensitivity, *Metal ions, Preconcentration, Sample preparation, Detection limits, Chemical interference, Errors, Precision, Pyrolytic graphite electrodes.

The sensitivity of x-ray fluorescence for the analysis of metal ions in aqueous solutions can be improved by preconcentration of the solution. A preconcentration procedure has been developed which consists of electrodeposition of the metals to be determined onto a pyrolytic graphite electrode. This separates the reducible metal ions from the dilute solution into a form particularly suitable for saalysis by x-ray fluorescence. After deposithe dilute solution into a torm particularly suitable for analysis by x-ray fluorescence. After deposi-tion, a thin dish is cleaved from the electrode sur-face and analyzed. The method has been evaluated by analysis of Cu, Hg, Zn, Ni, Co, and Cr in solu-tions of low electrolyte concentration (approxi-mately fresh water) and with conventional levels

of supporting electrolyte. By the criterion of 'total error', all the results fall into the 'excellent' category except for the Cr results which are 'acceptable'. It is concluded that the method is useful for ppm determinations of the metals studied, is amenable to improved sensitivity, and can be modified for analysis of additional metal ions. (Littie-Battelle) W73-11043

IDENTIFICATION OF HEAVIER AROMATIC COMPONENTS IN REFORMED PETROLEUM PRODUCTS BY DIRECT COUPLED CAPILLA-RY GAS CHROMATOGRAPHY-MASS SPECTROMETRY, Gulf Research and Development Co., Pittsburgh, Pa. Pennsylvania.

J. T. Swansiger, and F. E. Dickson.
Analytical Chemistry, Vol 45, No 4, p 811-813, April 1973. 2 fig, 2 tab, 13 ref.

Descriptors: Organic compounds, *Mass spectrometry, *Gas chromatography, *Aromatic compounds. Identifiers: "Reformates, "GC-mass spec-trometry, Bolling point, Gasoline, Kerosene, "Oil characterization, Chromatograms, Petroleum products, Benzene, Methyl diethyl benzene, Naphthalene.

Naphthalene.

The objective was to identify as many components in the C10 and heavier range of reformed petroleum products and to utilize to the fullest extent possible the capabilities of the mass spectrometric interface in identifying the capillary GC peaks. It was possible to isolate the C10-C11 fractions from a typical reformate and the C11-C14 fraction from an alkylated reformate. The major peaks appearing in the capillary GC of the C10-C11 cut (2) peaks) were identifiedand 95 percent (13 peaks) in the C11-C14 fraction were identified. The C10-C11 fraction was isolated by preparative gas chromatography using a 5-1/2 ft column packed with OV-1 on Chromosorb P. This fraction was injected into a 200 ft column with (m-phenoxy, phenoxy) benzene/squalane and programmed from 50 to 90C at 1C per minute. The C11-C14 fraction was isolated by distillation of components boiling above at 1C per minute. The Ci1-Cl4 fraction was iso-lated by distillation of components boiling above 187 C. The distillate was injected in a 150-ft column coated with polyphenyl ether and pro-grammed from 50 to 160 C at 5 C per minute. Mass spectra were obtained at 70 eV with an ionizing current of 150 micro amps. The GC peaks were scanned at 2 sec per decade for the C10-C11 frac-tion and 4 sec per decade for the C11-C14 decade. The chromatograms, formulas, compound names, and boiling points of the fractions are listed. (Lit-tie-Battelle)

SPECTROPHOTOMETRIC DETERMINATION OF SULFATE ION WITH BARIUM IODATE AND THE LINEAR STARCH IODINE SYSTEM, Sam Houston State Univ., Huntaville, Tex. Dept.

or Chemistry.
W. L. Hinze, and R. E. Humphrey.
Analytical Chemistry, Vol 45, No 4, p 814-815,
April 1973. 2 tab, 12 ref.

Descriptors: *Aqueous solutions, *Sulfates, *Spectrophotometry, Ions, *Ion exchange, Bicar-bonates, Sulfites, Bromides, Chlorides, Nitrates, Alkalis (Bases), Absorbance. Identifiers: *Sample preparation, *Detection limits, Chemical interference, Recovery, Borates.

A spectrophotometric method has been developed for the determination of sulfate ions in the low ppm range which involves an ion-exchange reaction with a slightly soluble sulfate and release of an absorbing anion into the solution. Barium iodate and linear starch iodide were used in solutions of sodium sulfate. Two dilution procedures were used to cover larger ranges of concentrations. Sulfate ions were measured over the range of 1-4

ppm with a lower dilution, and the effective molar absorptivity for sulfate was 31,000. With a higher dilution, the range was 4-14 ppm and the molar absorptivity was 9400. Color reactions were stable and the results were reasonably reproducible. As very limited study of interferences showed that bicarbonate, borate, hydroxide, and sulfite ions could not be tolerated while bromide, chloride, and nitrate ions had no effect. Results with barium iodate compare favorably with those from the chloroanilate method. (Little-Battelle)

METHOD FOR EXPOSING BACTERIAL CUL-TURES ON SOLID MEDIA TO A DEFINED GAS MIXTURE USING NYLON BAGS, Agricultural Research Council, Brighton (En-gland). Unit of Nitrogen Fixation.

Laboratory Practice, Vol 22, No 3, p 193, March 1973. 1 fig, 4 ref.

Descriptors: "Cultures, "Bacteria, Methodology, "Gases, "Anaerobic bacteria, Oxygen, Nitrogen, Laboratory equipment. Identifiers: "Mixtures, Derxia gummosa, Cloridium pasteurianum, Desulfovibrio desulfuricans, Nylon bags, Growth media, Culture

In order to avoid any alteration of bacterial growth, a method has been devised for using nylon bags in the exposure of bacterial cultures on solid media to a defined gas mixture. The bage ensure a constant gas composition throughout the incubation period. Large numbers of cultures can easily be handled and growth can be observed without exposing the cultures to air. A description is given of the apparatus which has been used successfully for investigating the effect of 02 concentration on colony formation of Derxia gummosa grown on solid N-free media (Hill, 1971). The obligate annerobes Clostridium pasteurianum and Desufovibrio desulfuricans have been grown on solid media in nylon bags: Clostridium pasteurianum on thioglycollate medium (Oxoid Ltd, England) under N2 plus 1 percent CO2 and Desulfovibrio desulfuricans on Baars's medium (Pankhurst, 1966) under N2. (Holoman-Battelle)

THE EXTRACTION OF DIVALENT COBALT, COPPER, ZINC AND CADMIUM FROM HYDROCHLORIC ACID SOLUTIONS BY TRI-N-BUTYL PHOSPHATE, Shizuoka Univ., Hamamatsu (Japan). Dept. of Applied Chemistry.
T. Sato.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 12, p 1233-1242, December 1972. 4 fig, 4 tab, 24 ref.

Descriptors: "Cations, "Cobalt, "Copper, "Zinc, "Cadmium, "Solvent extractions, "Aqueous solutions, Heavy metals, Separation techniques, Efficiencies, Phosphates, Acids.
Identifiers: Tri-a-butyl phosphate, Organic solvents, Chemical indicators, EDTA, Xylenol orange, Infrared spectra, Absorption spectra, Hydrochloric acid, Benzene, Kerosene.

The partition of divalent cobalt, copper, zinc, and cadmium between hydrochloric acid solutions and solutions of tri-n-butyl phosphate (TBP) in benzene or kerosene has been investigated under different conditions. Further the absorption spectra of both the aqueous and organic phases have been studied, and the infrared spectra or the organic phases have been examined. The order of the extraction efficiency of TBP for divalent metals is Zn greater than Cd greater than Cu for aqueous HCl less than 8 M and Zn greater than Cd greater than Cu for aqueous HCl greater than S M. (Holoman-Battelle)

Group 5B - Sources of Pollution

5B. Sources of Pollution

MICROBIAL CHANGES AND POSSIBLE GROUND WATER POLLUTION FROM POULTRY MANURE AND BEEF CATTLE FEEDLOTS IN GEORGIA, Georgia Univ., Athens. Dept. of Agronomy. J. Giddens, A. M. Rao, and H. W. Fordham. Available from the National Technical Information Service as PB-220 956, \$3.00 in paper copy, 30.95 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Atlanta Report ERC-0573, May 1973, 57 p. 14 fig. 16 tab, 6 ref. OWRR A-031-GA (1), 14-31-0001-3210.

Descriptors: *Farm wastes, Confinement pens, *Feed lots, *Fertilizers, Soil microbiology, *Nitrates, *Poultry, *Coliforms, Water pollution sources, *Georgia, *Microbial degradation, Path

Laboratory and field studies were used to determine the effect of methods of application and handling poultry manure upon nitrate and other nutrients in the soil and upon microbial changes during decomposition. Among the findings: one-half the nitrogen in poultry manure volatilizes upon air-drying. Repeated light applications of manure produce less soil nitrate (ground water polution) than fewer heavy applications totaling the same amount, and applications on the soil surface produce less nitrate than do those incorporated into the soil. Coliform bacteria decrease rapidly when manure is worked into the soil or exposed to the ammonia produced in the manure. Soil fungi decrease during early manure decomposition stages. Coliforms reach high levels in nearby ponds after rainfall periods. Soil surveys at 21 beef cattle feedlots also indicate that contamination from surface runoff is a much greater pollution from surface runoff is a much greater pollution hazard than ground water contamination. Ground water contamination contamination is minimized by allowing the manure to volatilize at the soil surface. (James-Geo Tech) W73-10403

THE ORIGIN, EFFECTS AND CONTROL OF TURBIDITY IN AN URBAN RECREATIONAL LAKE, Massachusetts Univ., Amherst. Water Resources

Massachusetts Univ., Amherst. Water Resources Research Center. C. Carranza, and S. M. Bemben. Available from the National Technical Informa-tion Service as PB-220 963, \$5.45 in paper copy, 90.95 in microfiche. Completion Report FY73-5, February 1973, 106 p, 17 fig, 3 tab, 8 photo, 60 ref. OWRR A-037-MASS (1).

Descriptors: *Urbanization, *Turbidity, Recrea-tion wastes, Pollution, *Massachusetts, Storm water, Color, Suspended solids, Suspended load, Dissolved solids, Ions, Bottom sediments, Water

pollution sources.

Identifiers: *Chicopee (Mass), Lake Pollution, Storm water pollution, Street pollution, *Mountain Lake (Mass), Dissolved ions.

State of the art' is described of the water quality parameter known as turbidity, particularly with regard to the effects of urbanization on a recreational water body. Field and laboratory data are presented which support a new broader definition for the parameter. For the general case, it is shown that turbidity is a composite parameter which is well related to apparent color, suspended solids. The concentrations, dissolved ion concentrations and the optical properties of suspended solids. The traditional relationships to B.O.D., D.O., CO2, total hardness, alkalinity, and pH are not challenged but rather are augmented. For the specific field case considered, it is shown that the degree of turbidity is related to the character and degree of urbanization, the natural geologic setting and of urbanization, the natural geologic setting and the weather conditions.

INFLUENCE OF NA3NTA AND NA4 EDTA
UPON THE ACTIVATION OF METALS IN
RIVER AND LAKE SEDIMENTS IN
MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Crop
and Soil Sciences.
B. D. Knezzek, L. M. Mugwira, and B. G. Ellis.
Available from the National Technical Information Service as PB-220 950, \$3.00 in paper copy,
\$0.95 in microfiche. Project Completion Report,
Michigan Institute of Water Research, May 1973,
26 p, 4 fig., 13 tab. OWRR A-043-MICH (1), 14-310001-3222.

Descriptors: *Chelation, *Phosphorus, Detergents, *Michigan, Lakes, Lake sediments, *Nitrilotriacetic acid, Rivers, *Metals, *Bottom

Identifiers: Red Cedar River (Mich), Grand River (Mich), *EDTA, Chelating agents.

Bottom sediments were collected from the Red Cedar River, above and below the watewater discharge of a metal workings plant, from the Grand River, above and below the sewage disposal discharge of the City of Grand Rapids, Michigan, and from six lakes for metal activation studies. These sediments were equilibrated with O, 10 to the minus 6th power, 10 to the minus 5th power and 10 to the minus 4 power, M Na3NTA and Na4EDTA for 1, 3, 6, 9 and 14 days and Grand Rapids sewage sludge was equilibrated with these solutions for one day to determine the amount of metals solubilized. Trisodium NTA and Na4EDTA at concentrations of 10 to the minus 5th power M and 10 to the minus 4th power M solubilized significant amounts of Ni and Za, but only from sediments contaminated with high amounts of these metals. The percentages of the metals extracted indicated that Na3NTA was most effective in solubilizing Ni and Na4EDTA was most effective in solubilizing Ni and Na4EDTA was most effective in bilizing Ni and Na4EDTA was most effective in builting Ni and NA4EDIA was most effective in solubilizing Zn. With sediments low in total Ni and Zn both chelates tended to solubilize more Fe and Cu. The amounts of Fe and Cu extracted, how-ever, were minute when compared to Ni and Zn solubilized. In general Na3NTA and Na4EDTA did not influence the removal of Ca, Mg, Mn, or Cr from the river or lake bottom sediments even cr from the river or take bottom secliments even though total metal contents of these elements were often high. The amount of metal solubilization from sediments due to chelation with Na3NTA was not great enough to be a probable environmental threat under the conditions investigated. W73-10408

INFLUENCE OF VEGETATION AND SUB-STRATE ON STREAMWATER CHEMISTRY IN NORTHERN UTAH, Utah Center for Water Resources Research,

Logan.

G. E. Hart, A. R. Southard, and J. S. Williams.

Available from the National Technical Information Service as PB-220 954, \$3.00 in paper copy,

\$0.95 in microfiche. Completion Report April 1973.

33 p, 9 fig, 20 tab, 8 ref. OWRR A-007-UTAH (2).

14-31-0001-3545.

Descriptors: *Chemistry of precipitation, *Throughfall, Trees, Water chemistry, Nutrients, *Utah, *Douglas fir trees, *Juniper trees, Geology, *Nutrient analysis, Drainage. Identifiers: Nutrient budget.

Chemical composition of precipitation, throughfall under Douglas fir and under junip trees, and of streamwater from two mountain trees, and of streamwater from two mountain-brush drainages in northern Utah were monitored for two years, Elements examined were sodium, calcium, magnesium, potassium, phosphorus, nitrate nitrogen, conductive, and acidity. Precipitation chemistry was somewhat greater than values reported for other regions and displayed an increase in concentrations in spring and summer. This increase is attributed to dry fallout of dust produced by agricultural activities or from dry salt flats upwind of the area. Concentration of cations were from 3 to 16 times greater under trees than in open precipitation. Large percentage increases were observed in throughfall for phosphorus and nitrate nitrogen, although absolute values reamined rather low (about 4 ppm and 5 ppm, respectively). Douglas-fir consistently yielded higher concentrations in throughfall than did juniper, due probably to differences in canopy area and growth form. Analyses of streamwater showed concentrations of sodium and magnesium that were about in proportion to the percentage of calcareous bedrock (limestone or dolomite) in the two drainages. Nutrient budgets for this locality show a net loss of 40 to 100 lbs/acre/yr of calcium and 20 to 40 lbs/acre/yr of magnesium. Inputs and outputs of sodium and potassium were about in balance while the input of nitrates was three times greater than output.

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DEEP WATER RENEWAL IN SAANICH INLET, AN INTERMITTENTLY ANOXIC BASIN, Washington Univ., Seattle. Dept. of Oceanog-

raphy,
J. J. Anderson, and A. H. Devol.
Estuarine and Coastal Marine Science, Vol 1, No
1, p 1-10, January 1973. 6 fig, 1 tab, 10 ref. NSF
Grant GA-10084.

Descriptors: *Water circulation, *Density stratifi-cation, *Fjords, *Water chemistry, Dissolved ox-ygen, Sulfates, Sulfides, Nitrates, Density cur-

Identifiers: *Sannich Inlet (B C).

Identifiers: *Saanich Inlet (B C).

Saanich Inlet is a fjord on the southeast side of Vancouver Island. Its shallow sill is approximately 70 m deep and its inside depth average 236 m. Its bathymetry and a strong vertical pycnocline isolate the deep water, resulting in drastic changes in the chemical composition. The changes are initiated by biochemical processes reducing the oxygen concentration of the isolated deep water to a level where aerobic respiration is no longer favored. Organic matter is then oxidized by nitrate-reducing bacteria. Finally, when the nitrate concentration of the deep water reaches zero, or nearly so, sulfate reduction begins; sulfate becomes the terminal electron acceptor for the oxidation of organic matter and hydrogen sulfide is produced. Because of these processes, the deep waters of the fjord are frequently devoid of oxygen and nitrate and contain significant amounts of hydrogen sulfide in the spring and summer. In late summer or early fall, dense, oxygenated water reaches the sill of Saanich Inlet from Haro Strait and flows down into the basin, displacing the resident deep water. Renewals equivalent to 64% and 33% of the deepwater volume, calculated from nitrate budgets, occurred in 1962 and in 1969. The time for 37% renewal of the deep water was estimated to be about 12 days. (Knapp-USGS)

MATHEMATICAL SIMULATION OF TIDAL TIME-AVERAGES OF SALINITY VELOCITY PROFILES IN ESTUARIES. usetts Inst. of Tech., Can For primary bibliographic entry see Field 02L. W73-10436

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA, Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

Research Lept.
W. Egan.
Available from NTIS, Springfield, Va. 22151. AD754 009. Price \$3.00 printed copy; \$0.95
microfiche. Research Department Memorandum
RM-561J, December 1972. 24 p, 13 fig, 7 tab, 9 ref.

Descriptors: "Water quality, "Remote sensing "Aerial photography, "Virgin Islands, Water pol lution sources, Sedimentation, Waste disposal Thermal pollution, Analytical techniques, Air

Identifiers: *Charlotte Amalie Harbor (V I), *St. Thomas (V I), Aircraft imagery, Color photography, ERTS-A.

The harbor at Charlotte Amalie on St Thomas, Virgin Islands, has a concentration of many factors affecting water quality: untreated sewage effuent, sediment from navigation and dredging operations, runooff from a garbage dump, and hot effluent from a desalination/power plant. Imagery rom ERTS-A in association with aircraft imagery and ground truthing permits the characterization of water quality in terms of absolute color values. This necessitates the establishment of photometric standards resolvable by the ERTS-A sensors in order that atmospheric effects, which generally vary on sequential overpasses, may be determined and subtracted. The overall program is described together with typical numerical results. (Woodard-USGS) W73-10437

TRACER SIMULATION STUDY OF POTENTIAL SOLUTE MOVEMENT IN PORT ROYAL SOUND, SOUTH CAROLINA, Geological Survey, Washington, D.C. F. A. Kilpatrick, and T. R. Cummings. For sale by GPO, Washington, D.C. 20402 Price 90.55. Geological Survey Water-Supply Paper 1586-J, 1972. 27 p, 18 fig, 1 tab, 9 ref.

Descriptors: *Tracers, *Path of pollutants, *Dye releases, *Sounds, *South Carolina, Estuaries, Bays, Fluorescent dye, Sampling. Identifiers: *Port Royal Sound (SC).

A tracer study was conducted in Port Royal Sound, South Carolina, to simulate the movement and ultimate pattern of concentration of a solute continuously injected into the flow. A total of 750 pounds of Rhodamine WT dye was injected by boat during a period of 24.8 hours in a line across the Colleton River. During the following 43 days, samples of water were taken in the sound, and the concentration of dye in the samples was determined by fluorometric analysis. The data obtained in the field study were used with theoretical models to compute the ultimate pattern of concentration of nonconservative and conservative solutes for a hypothetical continuous injection at the site on the Colleton River. (Knapp-USGS) W73-10446

CORRELATION OF OILS AND OIL PRODUCTS BY GAS CHROMATOGRAPHY, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05A. W73-10459

ANALYSES OF DREDGED WASTES, FLY ASH, AND WASTE CHEMICALS - NEW YORK METROPOLITAN REGION, State Univ. of New York, Stony Brook. Marine Sciences Research Center. For primary bibliographic entry see Field 05A. W73-10462.

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SALMONELLAE AND EDWARDSIELLA TARDA IN GULL FECES: A SOURCE OF CONTAMINATION IN FISH PROCESSING PLANTS, Oregon State Univ., Corvalis. Dept. of Microbiology. R. W. Berg, and A. W. Anderson. Applied Microbiology, Vol. 24, No. 3, p 501-503, September 1972. 1 tab, 12 ref.

Descriptors: "Salmonella, Aerobic bacteria, Water pollution sources, "Gulls, Path of pollutants, Fish, Fish handling facilities, Water birds, Oregon, Food processing industries. Identifiers: "Edwardsiella tarda, "Food contamination, "Fish processing plants, Feces, "Fecal pollution, Salmonella typhimurium, Salmonella reading, Salmonella enteritidis, Larus, Selective media, Enrichment.

The incidence of Salmonella and Edwardsiella tarda in gull feces on the Oregon Coast was studied to determine the role these birds may have in the contamination of fish products with these organisms. Approximately 2.1 and 0.4 percent of \$21 fecal specimens examined were found to contain Salmonella or E. tarda, respectively. (Holoman-Salmonella Battelle) W73-10463

THE APPLICATION OF MULTI-ATTRIBUTE SCALING PROCEDURES TO THE DEVELOP-MENT OF INDICES OF VALUE, Michigan Univ., Ann Arbor. Engineering Psychology Lab. For primary bibliographic entry see Field 05A. W73-10464

MARINA DEL REY: A STUDY OF ENVIRON-MENTAL VARIABLES IN A SEMI-ENCLOSED

MENTAL VARIABLES IN A SEMI-ENCLOSED COASTAL WATER,
University of Southern California, Los Angeles. Environmental Engineering Program. F. R. Bowerman, and K. Y. Chen.
Available from the National Technical Information Service as COM-72-11123, \$3.00 in paper copy, \$0.95 in microfiche. Sea Grant Publication No. USC-SG-4-71, December 1971. 59 p, 14 fig, 13 of

Descriptors: Water quality, Water pollution sources, Storm water, "Heavy metals, "Sediments, "Chlorinated hydrocarbon pesticides, "Sea water, Water analysis, Storm runoff, Lead, Cadmium, Mercury, Manganese, Iron, Dissolved oxygen, Hydrogen ion concentration, Gas chromatography, Sampling, Turbidity, Salinity, Benthos, Water temperature, Hydrogen sulfide, Organic matter, Detritus, Colorimetry, Alkalinity, Carbon, 24-D, 24-5-T, Endrin, Heptachlor, DDE, DDT, Aldrin, Coasts, "California. Identifiers: Sample preparation, Preconcentration, "Atomic absorption spectrophotometry, "Electron capture gas chromatography, Species diversity, "Marina del Rey (Calif), Antimony, Settleable solids, Secchi disks, Total solids, Parathion, PCNB, Telodran, Dyrene, Heptachlor epoxide, Lindane, Neburon, Hexachlor benzene, Methyl ester 2 4-D, BHQ, Ichyl ester 2 4-D, BHC, Chlordane, Toxaphene, o p' DDT, Dichlone, Diuron, p

The Marina del Rey boat harbor of southern California was studied to determine the current environmental conditions of the marina and the potential sources of contamination form the surrounding environment. Storm water and water from the marina were analyzed for clarity by Secchi disk, for temperature using a portable DO-temperature meter, for salinity using a conductivity meter, for turbidity by the Jackson Candle Method, and for hydrogen sulfide by colorimetry. Storm water and water and sediments from the marina were also analyzed for chlorinated hydrocarbons by electron capture GC and for metals (Cd, Pb, Hg, Mn, Fe, Sb) by AA. The extraction and preconcentration techniques are described. The following general conclusions were drawn: (1) The measurements of the dissolved oxygen, pH, alkalinity, turbidity and salinity show that the environmental variables of the Marina are within satisfactory levels. (2) The biological indices such as diversity and density of benthic life are very low in the Marina. (3) The quality of storm water is considered to be relatively harmless to the water quality of the Marina. (4) Chlorinated hydrocarbons are largely absent in storm water and in water samples of the Marina. However, in some locations of sediment, significant amounts of chlorinated pesticides have been detected. (5) Higher than normal concentrations of lead in both the Marina and storm water samples probably stem from automobile and marine exhausts. (6) Concentrations of heavy metals such as mercury and cadmium are generally low in water samples. stem from automotile and marine exhausts. (a) Concentrations of heavy metals such as mercury and cadmium are generally low in water samples. However, significant accumulations in sediment

have been detected. (7) Accumulation of sediment from storm waters is significant. (8) Debris from Ballona Creek in the breakwater region appear to affect the bottom conditions of the Marina. (Little-Battelle) W73-10465

MULTI-SENSOR DETECTION AND TRACKING OF CONTROLLED OIL SPILLS, Spectran, Inc., Hollywood, Calif. Microwave Sensor Systems Div.

J. C. Aukland, J. D. Sohn, and L. E. Rasrussen.
Available from the National Technical Information Service as AD-741 953, \$3.00 in paper copy, 90.95 in microfiche. Final Report, May 1971. 138 p, 62 fig, 9 tab. Contract No. DOT-CG-11996-A.

Descriptors: *Oil spills, *Remote sensing, *Aerial photography, *Infrared radiation, *Ultraviolet radiation, Pollutant identification, Oil, Analytical techniques, Oil pollution, Equipment, Data processing, Ocean waves, *California. Identifiers: *Microwave radiometers, Crude oil, No. 2 fuel oil, No. 6 fuel oil, Infrared scanners, Cameras, Sensors, Fuel oil, Radiometery, Radiometers, Multispectral sensing system.

Airborne remote sensing of controlled oil spills was carried out off the Coast of California during was carried out off the Coast of California during December 1970 and January 1971. The pollutants investigated were number 2 fuel oil, number 6 fuel oil, light crude oil, and heavy crude oil. All spills were made at a ships speed of 15 knots with spill rates of 0.5, 1.0, 2.5, and 5.0 GPM. All spills were made in at least three separate sea states, ranging from flat, zero sea-states to sea-states of 3 or greater with high wind velocities. The sensors used included two dual polarized microwave radiometers operating at 10.2 GHz and 30 GHz, an infrared canner operating in the 8-14 micror resion, and a included two dual polarized microwave radiometers operating at 10.2 GHz and 30 GHz, an infrared scanner operating in the 8-14 micron region, and a 4-lens camera employing filters in the visible and the ultraviolet wavelengths. The purpose was to obtain information on detecting oil on the sea's surface and to compare this with other data. From this information recommendations were made for equipments and design parameters for an all-weather system. On the basis of this experiment and previous experiments on controlled oil spills, it is recommended that the primary sensing device be an 8-14 micron infrared scanner backed-up by a 35 GHz scanning microwave radiometer to provide all-weather capabilities. Documentation to analyze the quantity and types of oil spilled should be taken by a dual camera system operating in the 36-4 micron region and the 6-7 micron region. A control station is required in which the operator can view the scene prior to photographing and to record that information on video tape as well as photographic film. All of the proposed sensors are presently available and may be integrated into an all-weather pollution surveillance system without further development. Additional photographic data should be gathered on various controlled and accidental spills to increase the experience factor in oil rate identification. (Little-Battelle)

PERSISTENCE OF PARATHION IN SIX CALIFORNIA SOILS UNDER LABORATORY

CALIFORNIA SOLLS UNDER LABORATURY CONDITIONS, California University, Riverside, Citrus Research Center and Agricultural Experiment Station. Y. Iwata, W. E. Westlake, and F. A. Gunther. Archives of Environmental Contamination and Toxicology, Vol. 1, No. 1, p 84-96, February 1973. 5 fig, 1 tab, 17 ref.

Descriptors: *Microbial degradation, *Hydrolysis, *Soil analysis, *Separation techniques, Soils, Gas chromatography, Pesticide residues, Organic matter, Flooding, Soil moisture, Path of pollu-

Identifiers: *Gas liquid chromatography, Per-sistence, *Parathion chemical, Recovery, Aminoparathion, Sample preparation.

Group 5B-Sources of Pollution

Six California soils, Mocho silt loam, Linne clay, Madera sandy loam, Laveen loamy sand, Windy loam, and Santa Lucia silt loam, were contaminated with parathion with moisture contents of 40 percent saturation or simulated flooding to investigate parathion persistence. The samples were kept in enameled trays fitted with glass covers for periods up to 8 months. Samples were extracted by adding a benzene-acetone mixture, repeated shaking, decanting the supernatant onto a column of sodium suifate and collecting the chaate. The recovery of parathion was 95-101 percent. The extracts were analyzed by GLC using an alkali flame ionization phosphorus detector and columns (1.52 m x 3.2 mm o.d.) packed with 10 percent. OF-101 on 80/100 mesh Gas Chrom Q for parathion in the presence of aminoparathion or a mixture of 15 percent DC-200 and 15 percent DC-1 separately coated on Gas Chrom Q for aminoparathion. The studies show that most parathion applied to soils disappears rapidly but low levels are retained for long periods. The persistence of parathion is partially dependent on soil type. In Mocho silt loam, Linne clay, Madera sandy loam, and Laveen loamy sand, degradation is rapid and is attributed to a combination of hydrolysis and strong microbial activity that overshadows differences in soil type. In contrast, loss from Santa Lucia silt loam and Windy loam soils is slow and is attributed to hydrolysis. The organic matter contents of the six soils correlate well with the parathion persistence. Parathion disappears faster in the soils with lower organic matter. Parathion degradation did not appear to be greatly accelerated by flooding. (Little-Battelle) W73-10476

UPTAKE AND BIOTRANSFORMATION OF PHENYLMERCURIC ACETATE BY AQUATIC

Oregon State Univ., Corvallis. Dept. of Agricul-tural Chemistry.

Archives of Environmental Contamination and Teoxicology, Vol. 1, No. 1, p 18-26, February 1973. 4 fig. 3 tab, 5 ref.

Descriptors: *Bioassay, Absorption, Metabolism, Radioactivity techniques, Radiochemical analysis, Freshwater fish, Aquatic plants, Chemical analysis, Lboratory tests, Water sampling, Organic compounds, Fungicides, Path of pollutants, Tracers, Aquatic weeds, Snails, Aquatic life.
Identifiers: *Phenylmercuric acetate, *Elodea canadensis, *Lebistes reticulatus, *Helisoma campanulata, *Ceratophyllum demersum, *Biotransformation, Biological magnification, Bioaccumulation, Metabolites, Excretion, Fate of pollutants, Hg-203, Slimicides, Electron capture gas chromatography, Scintillation counting, Biological activity, Half-life, Ethylmercuric chloride, Sample preparation, Guppy, Mercury radiosiotopes.

Guppies (Lebistes reticulatus), snails (Helisoma campanulata), elodea (Elodea canadensis), and campanulata), elodea (Elodea canadensis), and coontail (Ceratophyllum demersum) were exposed to 0.05-0.5 microM of Hg-203-labeled phenylmercoontail (Ceratophyllum demersum) were exposed to 0.05-0.5 microM of Hg-203-labeled phenylmercuric acetate (PMA) in order to study the uptake and metabolism of the slimicide by aquatic organisms. Studies were carried out in all glass aquaria with aeration at 25-29 C. A gamma-scintillation spectrometer was used to periodically measure radioactivity in samples of water and organisms. After measuring the total Hg-203 content, samples were homogenized in water containing HCl, extracted with benzene, purified according to the Westoo (1968) method, and analyzed by electron capture gas chromatography. Inorganic Hg-203 content was determined by the Clarkson and Greenwood (1970) method. Some guppies and clodea were placed in fresh water after the uptake period to determine PMA loss rate. The organisms tested were found to readily take up PMA. The PMA uptake was related to the time of exposure and the PMA concentration, the absorbed PMA being mainly converted to inorganic mercury. Ethylmercuric chloride was a minor metabolic product. Mercury-203 was not quickly eliminated from the guppy, elodea, and coontail when they were placed in fresh water, the biological half-life of Hg-203 residues ranging between 43 to 58 days. (Holoman-Battelle) W73-10477

KINETIC STUDY OF PHOSPHATE REACTION WITH ALUMINUM OXIDE AND KALONITE, Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics. Y. S. R. Chen, J. N. Butler, and W. Stumm. Environmental Science and Technology, Vol. 7, No. 4, p 327-332, April 1973. 8 fig. 3 tab, 35 ref.

Descriptors: "Phosphates, "Sediments, "Cydling nutrients, "Kaolinite, Water temperature, Hydrogen ion concentration, Chemical reactions, Kinetics, Clays, Clay minerals, Adsorption, Fluorides, X-ray diffraction, Electron microscopy, Laboratory equipment. Identifiers: Alumina, Rate constants, Activation

energy, Sample preparatio

To better define the role of sediments in cycling no setter detine the role of sediments in cycling nutrients in water systems, the quantitative reaction kinetics of phosphate with clay minerals (alumina and kaolinite) were studied at 25 C and 50 C. Reactions were carried out in cylindrical water-jacketed reaction vessels covered lucite plates to prevent loss of water vapor. Temperature and phewere carefully controlled. Precipitates were examined by electron microscopy and materials were identified by X-ray diffraction. The reaction of identified by X-ray diffraction. The reaction of aqueous phosphate (approx 0.0003 M) with alumina and kaolinite shows a rapid (12-24 hr) adsorption step followed by a slow process, obeying a first-order rate law, which extends over the next 60 days and probably involves nucleation and growth of a hexagonal AIPO4 phase. For kaolinite with 10.7 sq m/g surface area, solids concentration 7.5 g/l, pH equals 4.6, as well as for alpha-A1203 7.5 g/l, pH equais 4.6, as well as for alpha-A1203 with surface area 10 sq m/g, solids concentration 2.5 g/l, and pH equals 4.3, the first-order rate constant at 50 C is 0.222/day. Increasing temperature increases the rate with an activation energy of 2.4 Kcal/mol. Addition of fluoride ion decreases the mount of absorbed in this like activated but does amount of phosphate initially adsorbed but does not effect the first-order rate. The rate constant increases proportionally to the solid surface available, and decreases with increasing pH to essentially zero at pH more than or equal to 7. Successive addition of phosphate aliquots to the same sample of solid uses up the sites available for the rapid initial step but does not strongly influence the rate of the slow step. (Little-Battelle)

CHEMICAL EQUILIBRIUM MODELS OF LAKE KEYSTONE, OKIA., Oklahoma State Univ., Stillwater. Dept. of Chemistry. C. P. Falls, and L. P. Varga. Environmental Science and Technology, Vol. 7, No. 4, p 319-327, April 1973. 6 fig. 2 tab, 32 ref.

Descriptors: *Mathematical models, *Water quali-Descriptors: Mathematical models, Water quan-ty, Sediments, Thermodynamic behavior, Depth, Distribution patterns, Water temperature, Dis-solved oxygen, Carbon dioxide, Suspended solids, Dissolved solids, Hydrogen ion concentration, Calcium, Magnesium, Strontium, Sodium, Potasium, Bicarbonates, Carbonates, Sulfates, Fluorides, Silica, Sulfides, Chlorides, Montmorillonite, Clays, Illite, Calcite, Quartz, Kaolinite, *Oklahoma.

Identifiers: *Keystone Lake (Okla), *Chemical

A series of equilibrium models were formulated A series of equinorium moders were tormulated and compared with chemical and physical observations made from May, 1966 to June, 1968. Water properties determined were temperature, dissolved oxygen, dissolved CO2, suspended solids, dissolved solids, pH, and concentrations of Ca, Mg, Sr, Na, K, bicarbonate, carbonate, sulfate, fluoride, silica, sulfide, and chloride. X-ray diffraction of sediments and suspended solids showed the presence of montmorillonite, kaolinite, illite, quartz, and calcite. The models were based on the thermodynamic equilibrium condition of evaporite minerals (halite, gypsum, dolomite, calcite, and SrSO4), clays (kaolinite, sodium montmorillonite, and the liquid and gas phases which comprise the Lake Keystone drainage basin. Ten components were calculated by Gibbs phase rule, using analytical data for the total chemical compositions and the available thermochemical data. The model which simulated the experimental data most closely was based on the hypothesis that The model which simulated the experimental data most closely was based on the hypothesis that waters, originally in equilibrium with the common evaporite minerals of the Permian formation within the Arkansas River drainage basin, were diluted by fresher waters not exposed to these minerals as they flowed toward the reservoir. The waters then approached a state of chemical equilibrium with clay minerals which adjusted their final composition. (Little-Battelle) W73-10480.

SEASONAL FLUCTUATIONS OF IONIC COPPER IN KNIGHTS POND, MAS-SACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
K. D. Kimball.

Limnology and Oceanography, Vol 18, No 1, p 169-172, January 1973. 2 fig, 13 ref.

Descriptors: *Copper, *Path of pollutants, *Seasonal, Water pollution sources, *Water analysis, *Decomposing organic matter, Dissolved oxygen, Hydrogen ion concentration, Water temperature, Hardness (Water), Leaves, Chemical analysis, Spectrophotometry, Ponds, Fluctuations, *Massachusetts. peratua. analysis, Spe "Massa

Identifiers: Sample preparation, Knights Pond (Mass), Bioaccumulation, Transport, Mobiliza-

Ionic copper levels in Knights Pond (Mass.) were measured 34 times from April 19, 1971 to March measured 34 times from April 19, 1971 to manu-20, 1972, in order to investigate the copper cycle in this inland pond. DO, pH, temperature, total residue, and Ca-Mg haraness were also measured. Precipitation was measured daily. Copper in sam-ples was complexed with sodium diethyldithiocarbamate, the complex extracted with xylene, and the absorbance of the xylene-chelate determined with a spectrophotometer. Copper concentrations in the pond ranged from below detectability to 105 micrograms/liter over the 11 months. Values were low from summer through late fall, at which time they ascended to their highest level during mid-winter and then slowly decreased throughout late winter and soring toward the winter and spring toward the summer low values again. No significant correlations were found between copper and pH, total residue, or hard-ness. Moderate linear correlations were found between dissolved oxygen and copper at the surface stations. Copper is apparently concentrated in the vegetation during the growing season and released from the leaf litter by decomposition in the fall. The chemical characteristics of the watershed are unable to completely complex or precipitate this additional copper, resulting in in-creased concentrations in the pond during fall and winter. (Little-Battelle) W73-10487

OF CHLORINATED ADSORPTION HYDROCARBONS FROM SEAWATER BY A CROSSLINKED POLYMER,
Woods Hole Oceanographic Institution, Mass.

G. R. Harvey.

Available from the National Technical Information Service as PB-213 954, \$3.00 in paper copy, \$0.95 in microfiche. Report No. WHOI-72-86, November 1972. 31 p. 2 fig. 2 tab, 16 ref, 1 append. Contract No. EPA-CQ-16020.

Descriptors: *Polychlorinated biphenyls, *Adsorption, *Separation techniques, *Sea water, Water analysis, DDT, DDE, Dieldrin, Filtration, Gas chromatography, Sampling, Atlantic Ocean. Identifiers: *Amberlite XAD-2, *Sargasso Sea, Aroclor 1254, Recovery, Detection limits, On board analysis, Electron capture gas chromatography.

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the and A synthetic resin, Amberlite XAD2, was evaluated as an adsorption medium for chlorinated hydrocarbons (DDT, DDE, dieldrin, and PCB) in seawater with the objective of developing an analytical method for recovering low concentrations of these compounds. Testing of the resin was conducted with seawater containing dissolved organic carbon (DOC), and DDT, DDE, dieldrin, and PCB. The results with the DOC samples showed that coastal seawater contained about 20 percent hydrophobic organic matter and that at flow rates of 0.7 and 1.4 bed vol./min the resin preferentially adsorbed hydrophobic matter. Recovery of DDE, dieldrin, and DDT from seawater was 125, 108, and 92 percent respectively. The resin showed very good adsorption capacity. Chlorinated hydrocarbons were eluted with acetonitrile and ethanol. Analysis of Woods Hole seawater gave PCB ranges of 7.1 to 35 ppt and DDT ranges of less than 0.1 to 3.3 ppt. Concentrations of PCB's were also determined in water of the North Atlantic Ocean from the surface and various depths. The concentrations severaged 20 ppt. The surface water of the Sargasso Sea contains lower concentrations of PCB than the North Atlantic. The method developed is deemed suitable for seawater analysis and probably for freshwater. It is suggested that the resin could be used for in situ sampling while a ship is underway. (Little-Battelle) W73-10490 (Little-Battelle) W73-10490

COMPARATIVE STUDIES OF THIN LAYER CHROMATOGRAPHIC SYSTEMS FOR THE SEPARATION AND IDENTIFICATION OF PHOTOALTERATION PRODUCTS OF PARATHION, Mississippi Agricultural and Forestry Experiment Station, State College.
For primary bibliographic entry see Field 05A. W73-10493

METHODS OF ESTIMATING THE HALF-LIFE
OF BIOLOGICAL ACTIVITY OF TOXIC
CHEMICALS IN WATER,
Bureau of Sport Fisheries and Wildlife, La
Crosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 05C.
W73-10495

STRUCTURE ACTIVITY CORRELATIONS OF BIODEGRADABILITY OF DDT ANALOGS, Illinois Univ., Urbana. Dept. of Entomology. 1. P. Kapoor, R. L. Metcalf, A. S. Hirwe, J. R. Coats, and M. S. Khalsa. Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 310-315, March/April 1973. 4 fig. 5 tab, 15 ref

Descriptors: "Fish, "Snails, "Biodegradation, "Algae, Absorption, Metabolism, Radioactivity techniques, Invertebrates, Chromatography. Identifiers: Methoxy-methiochlor, Methyl-ethoxychlor, Chloro-methylchlor, "Biomagnification, Metabolic pathways, Biodegradability index, Macroinvertebrates, Scintillation counting, Oedogonium, Gambusia, Physa, Thin layer fromatography, Partition coefficients, Mosquitofish.

Methoxy-methiochlor (2- (p-methoxyphenyl)-2- (p-methylthiophenyl) - 1,1,1-trichloroethane), methyl-ethoxychlor (2± (p-methylphenyl) - 2- (p-ethoxyphenyl) - 1,1,1-trichloroethane), and chloro-methylchlor (2- (p-chlorophenyl) -2- (p-methylphenyl) - 1,1,1-trichloroethane) were studied for metabolic pathways in mice and insects (salt marsh caterpillar) and for biodegradability in

a model ecosystem which included algae, fish, snails, and mosquitoes. The compounds were radiolabeled and radioassayed by scintillation counting. The metabolic products were identified by chromatography. The distribution of metabolites is shown for each organism. All three compounds are highly degradable with methoxymethiochlor the most fugitive. With Gambusis biomagnifications of undegraded products were 300-fold for methoxy-methiochlor, 333-fold for methyl-chloxychlor, and 1400-fold for chloromethylchlor. With snails, the biomagnifications were 3400-fold for methoxy-methiochlor, 42,000-fold for chloro-methylchlor. The percentages of undegraded compound to total ranged from 1 to 25 percent. The pathways of metabolism are illustrated. Methoxy-methiochlor and methyl-ethoxychlor were good substrates for multifunction oxidases and showed biodegradability indices of 2.75 and 1.20, respectively. Chloro-methylchlor was also a satisfactory substrate and showed a biodegradability index of 3.43, compared to 0.015 for DDT. (Little-Battelle) W73-10504

HYDROLYSIS OF AQUEOUS SOLUTIONS OF SODIUM 2,2-DICHLOROPROPIONATE UNDER SELF-INDUCED ALKALINE CONDITIONS, Agricultural Research Service, Fargo, N. Dak. Metabolism Lab.

F. S. Tanaka, and R. G. Wien.

Journal of Agricultural and Food Chemistry, Vol
21, No 2, p 285-288, March/April 1973. 2 fig, 1 tab,

Descriptors: *Dalapon, *Chlorinated hydrocarbon pesticides, *Hydrolysis, *Aqueous solutions, Chemical reactions, *Chemical degradation, *Polutant identification, Herbicides, Hydrogen ion concentration, Organic acids, Mass spectrometry, Nuclear magnetic resonance. Identifiers: Sodium 2 2-dichloropropionate, *Flame ionization gas chromatography, *Metabolites, 2 2-Dichloropropionic acid, Gas liquid chromatography, Pyruvic acid, Hydrochloric acid, Infrared spectroscopy, Sodium dalapon, Vacuum distillation.

Aqueous solutions of sodium 2, 2-dichloropropionate were previously reported as having an approximate pH of 5 to 6. The data obtained in this study show that freshly prepared solutions of greater than about 0.9 m concentration exhibit a basic pH. Upon standing, however, these salt solutions become acidic due to the hydrolysis of the 2,2-dichloropropionate to yield pyruvate and hydrochloric acid. The approximate pH of the sodium 2,2-dichloropropionate solutions is estimated at different concentrations, and the rates of pH change due to hydrolysis are reported for a pH change due to hydrolysis are reported for a dilute, intermediate, and high concentration of material under mildly alkaline conditions. (Holoman-Battelle) 73-10506

DYNAMICS OF A SALT OF (2,4-DICHLOROPHENOXY) ACETIC ACID IN FISH, WATER, AND HYDROSOL, Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab. For primary bibliographic entry see Field 05C. W73-10507

BIOLOGICAL NITROGEN FIXATION IN THE GREAT LAKES,

Wisconsin Univ., Madison, Dept. of Biochemis-

try.
For primary bibliographic entry see Field 05C.
W73-10511

PRODUCTION OF THE GIANT KELP, MACRO-CYSTIS, ESTIMATED BY IN SITU INCOR-

PORATION OF C-14 IN POLYENTHYLENE

Stanford Univ., Pacific Grove, Calif. Hopkins

Marine Station.
D. W. Towle, and J. S. Pearse.
Limnology and Oceanology, Vol 18, No 1, p 155159, January 1973. 3 tab, 19 ref.

Descriptors: *Kelps, *Photosynthesis, *On-site investigations, Estimating, *Plant tissues, Marine algae, Marine plants, Phaeophyta, Primary productivity, Laboratory tests, Radioactivity techniques, Carbon radioisotopes, Methodology, Standing

crops.
Identifiers: "Macrocystis pyrifera, "Photosynthetic rates, C-14, Scintillation counting, Sample preparation.

Incorporation of C-14 by the giant kelp Macrocystis pyrifera was measured in situ by enclosing individual blades within polyethylene bags in a kelp bed. Incubation were carried out in full sunlight for 3 hr. The contents of the bag were removed to an opaque container, transported to a dimly lit laboratory, and rinsed in unlabeled seawater. Duplicate samples from 3 sections of each kelp blade were solubilized, mixed with H2O2 and added to scintillation fluid for counting. Incorporation was highest in the tips of the blades in the canopy, about 0.315 mg Clg/hr on the basis of wet weight. In the densest part of the kelp bed, total wet standing crop of Macrocystis was about 5.9 kg/sq m, and production of Macrocystis blades in that area was estimated to be at least 6.8 g C/sq m/day, or about 17 g organic matter/sq m/day. m/day, or about 17 g organic matter/sq m/day (Holoman-Battelle) W73-10516

STUDIES IN THE COMPLEX FORMATION OF METAL IONS WITH SUGARS. PART I. THE COMPLEX FORMATION OF COBALT (II),

COBALT (III), COPPER (II) AND NICKEL (II) WITH MANNITOL, Oslo Univ. (Norway). Dept. of Chemistry. J. Dolezal, K. S. Klausen, and F. J. Langmyhr. Analytica Chimica Acta, Vol 63, No 1, p 71-77, January 1973. 1 fig, 5 ref.

Descriptors: "Heavy metals, "Cations, "Spectrophotometry, "Alkali-aggregate reactions, Chemical reactions, Chediton, Organic compounds, Chemical analysis, Cobalt, Copper, Nickel, Carbohydrates, Manganese.

Identifiers: "Mannitol, "Complexation, Ligands,

Absorbance.

The complex formation of mannitol with cobalt (II), cobalt (III), copper (II) and nickel (II) in alkaline media (0.1 to 4 M potassium hydroxide) was studied by spectrophotometry. Cobalt (II) and cobalt (III) reacted with mannitol to form 1:1 complexes; the conditional constant (in 4 M potassium hydroxide) of the former complex was found to be 220,000. The reaction of copper (II) with the sugar gave two complexes. In the range 0.5-4 M potassium hydroxide and with the ligand in large excess, a CuM compound was formed; in mixtures with a small excess or with the reactants present in equimolar amounts, the species Cu2M predominated. In 0.5 M potassium hydroxide, the conditional constant of the latter compound was found to be 63 million. The low stability of the nickel (II) complex (es) with mannitol made it impossible to draw any definite conclusions as to the composition of the species formed in alkaline medium. (Holoman-Battelle) W73-10524 W73-10524

OXYGEN-CARBON DIOXIDE-NUTRIENTS RELATIONSHIPS IN THE NORTHEASTERN PACIFIC OCEAN AND SOUTHEASTERN BER-ING SEA, Oregon State Univ., Corvallis. S. Alvarez-Borrego.

Group 5B-Sources of Pollution

Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor Mich., 48106, Order No. 73-7816. Ph D Dissertation, 1973. 186 p.

Descriptors: *Dissolved oxygen, *Carbon dioxide, *Nutrients, *Pacific Ocean, *Model studies, Spatial distribution, Water temperature, Hydrogen ion concentration, Alkalinity, Calcite, Phosphates, Nitrates, Depth, Regression analysis, Mathematical models, Indian Ocean, Chemical precipitation, Calcium carbonate, Salinity, Density.

Identifiers: *Bering Sea, Vertical distribution, Description coefficients, Multiple linear regression.

Catcum caroonate, Samary, Bensiy. Identifiers: *Bering Sea, Vertical distribution, Regression coefficients, Multiple linear regression analysis, Seasonal variation, Aragonite, Data in-terpretation, Dissolution, Oxygen consumption.

The vertical distribution of density, salinity, tem-The vertical distribution of density, salimity, temperature, dissolved oxygen, apparent oxygen utilization, nutrients, preformed phosphate, pH, alkalinity, alkalinity:chlorinity ratio, 'in situ' partial pressure of carbon dioxide, and percent saturation of calcite and aragonite, for the Southeastern Bering Sea, is studied and explained in terms of biological and physical processes. Some hydrological interactions between the Bering Sea and the North Pacific Ocean are avalatined. It sa and the North Pacific Ocean are explained. In the Northeastern Pacific Ocean the oxygen-phosphate and oxygen-nitrate relationships for the region of the water column above the oxygen minimum zone vary systematically with latitude. In the entire vary systematically with alutude. In the entire water column, these slopes vary with depth. An ef-fect on the slopes of the oxyten-phosphate and ox-ygen-nitrate relationships, similar to that observed when decreasing latitude, is observed when comparing winter versus summer data. The winter slopes are higher than the summer slopes. Multiple regression analysis was applied to the oxygen, phosphate, nitrate, and potential temperature data from stations at different geographic locations in the Pacific and Atlantic Oceans. Confidence intervals for the regression coefficients are consistent with the values predicted by the Redfield model for the delta 02:delta PO4 and delta 02:delta NO3 ratios for biological processes. After the field ox-ygen, phosphate and nitrate data were found consistent with Redfield's model, preformed phosphates were calculated by using the model, and potential temperature versus preformed phosphates diagrams were constructed for different stations in the Pacific and Indian Oceans to study their water masses. In the Northeastern Pacific Ocean the total inorganic carbon dioxide-oxygen relationship varies with depth. Multiple linear regression analysis was applied to express total inorganic carbon dioxide, normalized to constant salinity, as a function of potential tempera-ture and total alkalinity and oxygen normalized to constant salinity. Results of the regression are in agreement with the assumption that total alkalinity changes in the open ocean are only due to salinity changes in calcium carbonate dissolution or precipitation, and with Redfield's model for the prediction of the total inorganic carbon dioxide-oxygen ratio for the biochemical oxidation. (Holoman-Battelle)

PROCESSES AFFECTING THE OCEANIC DISTRIBUTION OF CARBON DIOXIDE, Oregon State Univ., Corvallis.

C. H. Culberson.

Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-3957. Ph D Dissertation, 1972. 188 p.

Descriptors: *Carbon dioxide, *Oceans, *Model studies, *Spatial distribution, *On-site data collecstudies, "Spatial distribution, "On-site data conec-tions, "Water chemistry, Sea water, Pacific Ocean, Indian Ocean, Atlantic Ocean, Water pro-perties, Path of pollutants, Salinity, Hydrogen ion concentration, Alkalinity, Silicates, Phosphates, Nitrates, Nitrites, Oregon, Organic matter, Oxida-tion Unicolated oxygen, Degradation (Decomposition, Dissolved oxygen, Degradation (Decomposition), Calcium carbonate.

Identifiers: *Stoichiometric models.

The stoichiometric model of organic decomposi-The stoichiometric model of organic decomposi-tion in seawater (Redfield, Ketchum, and Richards, 1963) was used to describe the oceanic distribution of total carbon dioxide. It was as-sumed that the concentration of total carbon diox-ide was the sum of three terms: (1) the initial conside was the sum of three terms: (1) the initial con-centration of carbon dioxide, (2) the increase in carbon dioxide due to the oxidation of organic matter, and (3) the increase in carbon dioxide due to the solution of calcium carbonate. The vertical and horizontal distribution of total carbon dioxide in the Pacific, Indian, and South Atlantic Oceans was shown to conform to this model. The model for the distribution of total carbon dioxide was applied to the vertical distribution of carbon-13 at the North Pacific (1969) GEOSECS intercalibration Values of Delta C-13 calculated from the stoichiometric model agreed to within plus or minus 3 percent with the measured values at this station. Near-bottom chemical measurements were made on three cruises: YALOC-69 Eastern Tropical Pacific, Y6908F off the Oregon Coast, and TT-46 to the Caribbean Sea and North Atlantic. Salinity, oxygen, pH, alkalinity, silicate, phosphate, nitrate, and nitrite were measured at neights from 0.5 to 300 m above the bottom. No measurable salinity, oxygen, silicate, phosphate, nitrate, or nitrite gradients were observed. A statistically significant near-bottom increase in pH and alkalinity was found. However, the increase was small and could have resulted from undetected analytical and/or sampling errors. (Holoman-Battelle)

THE UPTAKE, STORAGE, AND RELEASE OF DIELDRIN AND SOME EFFECTS OF ITS RELEASE IN THE FISH, CICHLASOMA BIMACULATUM (LINNAEUS).

BIMACULATUM (LANAEUS), Michigan Univ., Ann Arbor. D. L. Brockway. Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-6797. Ph D Dissertation, 1972. 111 p.

scriptors: *Absorption, *Dieldrin, *Bioassay, Descriptors: "Absorption, "Dieldrin, Bloassay, "Pesticide toxicity, Laboratory tests, Pesticide residues, Path of pollutants, Fish physiology, Freshwater fish, Chlorinated hydrocarbon pesticides, Insecticides, Water analysis, Chemical analysis, Cichlids, Water pollution effects. Identifiers: "Bioaccumulation, "Cichlasoma bimaculatum, Mobilization, "Excretion,

Metabolites, Hormones, Fate of pollutants, Con-tinuous flow technique, Electron capture gas chro-matography, Gas liquid chromatography.

The uptake of the pesticide dieldrin from water, its storage in tissues of a tropical fish (Cichlasoma bimaculatum) and its release from storage has hear investigated Several parameters considered been investigated. Several parameters considered to be indicators of the effects on the fish of the release of dieldrin from tissue storage were also measured. Dieldrin in acetone solution was added to water in continuous-flow exposure vessels. The concentration of insecticide in water and fish tissue was measured by electron-capture, gas-liquid chromatography. Blood- and brain-dieldrin con-centrations were higher in fish killed by dieldrin an in fish exposed to dieldrin, but not killed. Uptake-release experiments were performed in which fish were exposed to sublethal concentrations (1 or 2 ppb) for up to 34 days. After this exposure, tis-sue residue levels had nearly reached a plateau. When exposere was terminated, the whole-body residue concentration factors on a wet-weight body concentrations were higher than brain, and blood concentrations were lowest. After the exposure period, the fish were held in water without dieldrin up to 59 days and subjected to fasting and/or a 5 C temperature rise. During the release period, fast-ing alone caused only a slow rate of loss of the whole-body dieldrin residues. Fasting plus a 5 C temperature rise produced a more rapid loss of

whole-body dieldrin residues. Fish which were fed whole-body discussing residues. Fish which were ted normally and subjected to the 5 C increase in temperature showed a very rapid loss of dieldrin and little loss of fat. Two types of measurements were made to study the probability of post-exposure sublethal effects: (1) blood- and brain-dieldrin consublethal effects: (1) blood- and brain-dieldrin con-centrations were measured in juvenile fish, and (2) excretion of 17-OHCS hormone metabolites in urine was measured in catheterized adult fish. During the post-exposure period there was not a significant increase in blood- or brain-dieldrin concentration above the final concentration of the ex-posure phase. The quantity of hormone metabolite excreted in urine was always higher in fish exposed to dieldrin than in controls after the first day of urine collection. The level of hormone excreor urne conection. The level of normone excre-tion, however, decreased continuously in exposed fish after the first. day. Under the test conditions, there was no evidence that dieldrin was released in toxic quantities when a fish was forced to utilize its fat stores. (Holoman-Battelle) 73-10536

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THE CARBON CYCLE IN THE EPILIMNION OF TWO MICHIGAN LAKES, Michigan State Univ. Bast Lansing. For primary bibliographic entry see Field 05C. W73-10538

POPULATION DYNAMICS AND THE EFFECT OF INORGANIC IONS ON CERTAIN MICROCRUSTACEA, Cincinnati Univ., Ohio. For primary bibliographic entry see Field 05C. W73-10542

THE RELATIONSHIP BETWEEN IONS AND CILIARY ACTIVITY IN THE GILL OF MYTI-LUS EDULIS,

Fordham University, Bronx, N.Y. For primary bibliographic entry see Field 05C. W73-10543

SIMULTANEOUS QUANTITATION OF SAL-MONELLA SPECIES AND PSEUDOMONAS AERUGINOSA. I. POLLUTED WATERS. II. PERSISTENCE OF PATHOGENS IN SLUDGE TREATED SOILS. III. ANALYSIS OF WASTE TREATMENT SLUDGES FOR SALMONELLA SPECIES AS A SURVEILLANCE TOOL, National Environmental Research Center, Cincinnati, Ohio.

B. A. Kenner, G. K. Dotson, and J. E. Smith Available from the National Technical Informa-tion Serice as PB-213 706, \$3.00 in paper copy, \$0.95 in microfiche. EPA Report, September 1971. \$0.95 in microfiche. EPA Report, Sept 36 p. 9 tab. 46 ref.

Descriptors: Water pollution, "Sludge treatment, Persistence, "Pathogenic bacteria, "Pollutant identification, "Monitoring, "Isolation, Waste treatment, Sewage treatment, Aerobic bacteria, Soil contamination, Coliforms, Municipal wastes, Sewage effluents, Waste water (Pollution), Mortality, Bioindicators, Soil-borne diseases, Human disease, Monitorial State of tanty, Biolindicators, Soil-borne diseases, Human diseases, Sewage disposal, Sludge disposal, Activated sludge, Sewage sludge, Trickling filters, Sampling, Methodology, Chemical analysis, Path of pollutants, Storm runoff. Identifiers: "Pseudomonas aeruginosa, "Salmonella spp, Fecal coliforms, Selective media, Sero-

la spp, recai contorms, setective media, Sero-types, Survival, Culture media, Agars, Biochemi-cal tests, Salmonella paratyphi A, Salmonella cu-bana, Salmonella tennessee, Arizona,Ultra-filter MPN method, Most probable number test, Enu-

A practical, sensitive, quantitative method for the isolation and enumeration of Salmonellae and pyocyanogenic Ps. aeruginosa from wastewaters, treatment effluents, streams, stormwater runoff, and sludges, in all seasons of the year, is described. The use of glass fiber ultra filters allows the testing of low turbidity to crystal-clear waters in a range from 1-liter to 10-gallon samples. The methods described are useful for testing treatment plant effluents, streams, well waters, and non-chlorinated drinking waters. An appendix and six tables describe in detail media employed, schemats for five multiple tube methods, quantitative results, and proof for claims made for critical temperature, and the use of glass fiber ultra filters. The persistence of Salmonella species, Pseudomonas aeruginosa, and fecal coliforms in soils treated with various types of municipal sludges is reported. From results obtained testing relatively small soil samples at weekly intervals, it is evident that sludge-borne pathogens may persist on agricultural or grass lands in the top two inches (5 cm) of soil for at least 21 weeks. It is suggested that a more complete and useful surveillance of salmonellosis for large urban areas can be attained by analysis monthly of municipal primary and secondary waste treatment plant sludges. Results obtained can indicate current high carrier rates of certain Salmonella serotypes or suggest the presence of pathogens in local food or feed products that may need inspection to avert spread. (Holoman-Battelle)

STUDY OF THE CONTAMINATION OF ARENICOLA MARINA L. BY COBALT-60, (ETUDE DE LA CONTAMINATION D'ARENICOLA MARINA L. (ANNELIDE POLYCHETE) PAR LM COBALT-60), Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Service de Recherches Toxicologiques et Ecologiques.
For primary bibliographic entry see Field 05C. W73-10551

THE STATE OF MARINE POLLUTION IN THE MEDITERRANEAN AND LEGISLATIVE CON-

TROLS.
Food and Agriculture Organization of the United Nations, Rome (Italy). General Fisheries Council for the Mediterranean.

Studies and Reviews No 51, 72 p, September 1972. 76 ref.

Descriptors: *Coasts, *Harbors, Water pollution sources, *Sewage, *Domestic wastes, Oil, Pesticides, Radioactive wastes, *Thermal pollution, Floatsam, Suspended load, Bottom sediments, Polychlorinated biphenyls, *Industrial wastes, Voil pollution.

Identifiers: *Mediterranean Sea.

A questionnaire was sent to all countries bordering the Mediterranean. The questionnaire covered the following subjects: pollution by domestic sewage, industrial pollution, oil pollution, other forms of pollution (such as pesticides, radioactive substances, thermal pollution, floating materials, suspended matter, bottom deposits, and PCBs), and legislation on water pollution. The state of pollution in inshore waters of the Mediterranean has reached a critical level. High quantities of domestic sewage are discharged untreated or insufficiently treated, and industrial effluents carry high organic loads. Almost total absence of control over industrial toxic and solid wastes prevails. The state of pollution in the open sea is almost as severe due to waste dumping, pipeline discharges, and high amounts of pesticides carried out by wind. Oil pollution of the beaches and inshore waters and even of the open sea is common. Discharge of oil residues is still allowed in some areas, and only 5 of 14 harbors have facilities for receiving such residues from tankers. Damage to fishing gear and the palatability of fish is extensive. In most Mediterranean countries insufficient attention is paid to pollution control and to the enforcement of legal regulations. (Ensign-PAI)

POLLUTION IN SOME BRITISH ESTUARIES AND COASTAL WATERS. Royal Commission on Environmental Pollution, London (England).

Third Report, September 1972. 128 p, 11 fig, 26 tab, 59 ref. 3 append.

Descriptors: "Estuaries, "Pollutants, Rivers, Runoff, "Discharge (Water), "Waste disposal, Tides, Scour, Water pollution control, Management, Regulations, Biota, Benthos, Fisheries, Fish, Governments, Monitoring, Research, Economics, Legislation.

Identifiers: *Great Britain, Wales, Scotland, England.

A great and increasing volume of pollutants reaches British estuaries from rivers and direct discharge, tidal scour cannot indefinitely continue to break down or disperse all such wastes. Estuaries have received too little protection from the British Government, and integration of estuarine pollution control policies with a national policy for waste disposal is suggested. The law should require maximum practical abatement before discharge of all pollutants which are unlikely to be rendered harmless by natural processes. The government should also adopt 2 biological criteria for management of estuarine waters: ability to support mud bottom fauna essential for sustaining sea fisheries and ability to allow passage of migratory fish at all tide states. Monitoring, research, economics, administration, and legislation for Wales, Scotland, and England are considered. (Ensign-PAI)

HEAVY METALS IN ESTUARIES AND THE COASTAL ZONE, Oregon State Univ., Corvallis. School of Oceanog-

raphy.

N. H. Cutshall.
In: Heavy Metals in the Environment, Seminar, Oregon State University, Water Resources Research Institute, October 5, 1972, Corvallis. p 37-44, January 1973. I fig, 1 tab, 13 ref.

Descriptors: *Coasts, *Estuaries, *Water pollution effects, *Heavy metals, Trapping, Aquatic life, Biota, Ecosystems, Fisheries.

Whether released to air or water or soil, heavy metal contamination is eventually carried into estuarine and coastal water systems. Estuaries serve as funnels, through which land runoff is transported into the coastal ocean. In some cases estuaries appear to effectively trap or delay a good deal of the heavy metal flux passing through them. Estuaries are also avenues by which anadromous fishes travel from spawning beds to the sea and return. Estuaries are spawning and nursery grounds for a wide variety of coastal organisms. Consequently, adverse changes in estuaries may be reflected in the biota of a broad geographic area beyond the estuary itself. Examples are given that show the complexity of heavy metal cycling in coastal ecosystems and also demonstrate that the role of natural partitioning in the effects of heavy metal contamination is substantial. (Ensign-PAI) W73-10555

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME
1.

Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 107, \$9.00 paper copy, \$0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-207, May 1973, 387 p.

Descriptors: *Bibliographies, *Oil spills, Oil pollution, Oil wastes, Oily water, Water pollution control, Water pollution sources, Water quality,

Cleaning, Dispersion, Emulsifiers, Legislation, Oceans, Ships, Pollutant identification, Pollution abatement, Remote sensing, Path of pollutants.

This report, containing 256 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). This volume includes abstracts of documents published through 1970. Author and subject indexes are included. (See also W73-10557)

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME

Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-221 108, \$10.60 paper copy, \$0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-207, May 1973, 446 p.

Descriptors: *Bibliographies, *Oil spills, Oil pollution, Oil wastes, Oily water, Water pollution control, Water pollution sources, Water quality, Cleaning, Dispersion, Emulsifiers, Legislation, Cocans, Ships, Pollutant identification, Pollution abatement, Remote sensing, Path of pollutants.

This report, containing 298 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). This volume includes abstracts of documents published in 1971-1972. Author and subject indexes are included. (See also W73-10556)

NITRATE REDUCTION IN THE VICINITY OF TILE DRAINS.

Illinois Univ., Urbana. Dept. of Agricultural En-

L. A. Davenport, W. D. Lembke, and B. A. Jones. Available from the National Technical Information Service as PB-21 020, \$3.00 in paper copy, \$0.95 in microfiche. Illinois Water Resources Center, Urbana Research Report No 64, March 1973. 107 p, 30 fig, 10 tab, 25 ref. 2 append. A-044-ILL (1). 14-31-0001-3513.

Descriptors: *Denitrification, *Drainage, *Nitrates, Porous media, Temperature, Water pollution control, *Tile drains, Path of pollutants. Identifiers: *Substrate materials, *Temperature effects. *Methanol.

The fate of nitrates as they travel through a long porous column at a slow rate was observed in this study with temperature and substrate materials variable. During a one month period of flow with pore velocities averaging up to 21 centimeters per day, losses as high as 89 percent were found for a methanol treatment at 24 degree C while for 13 degree C losses were reduced to 46 percent. A sawdust substrate material resulted in very little reduction of nitrate concentrations at 24 degree C and actual increases (presumably from mineralization) at 13 degree C. Since methanol was found to be an effective means of removing nitrate from a slowly moving stream of water at temperatures as low as 13 degree C, it will be used as a standard in future field studies to evaluate less expensive substrate materials.

Group 5B—Sources of Pollution

A PROTOTYPE TOTALISING CURRENT-METER (MARK II); A SELF-MOORED VERSION FOR NEAR-SURFACE USE ESPECIALLY IN FOUL WATER ESTUARIES IN CONNECTION WITH POLLUTANT DISPERSAL STUDIES, National Inst. of Oceanography, Wormley (En-

guntus. J. N. Carruthers. Bulletin, Institut Oceanographique, Monaco. Vol 70, No 1418, 15 p. 1972. 2 fig, 7 ref.

Descriptors: *Pollutants, *Dispersion, *Currents (Water), *Current meters, Design data, Estuaries. Identifiers: Totalizing self-moored current-meter,

A new self-moored totalizing current meter was made expressly for recording the totality of upper water movements in eight directions over a period of a week or more for application to questions of pollutant dispersal. The instrument is entirely mechanical and works on the Ekman ball-dropping principle. The various features of the instrument are described. Observations made with the instrument have lasted for about 14 days, but the time could be doubled or tripled by using a bigger hopper. Important features of the instrument include the facts that no dirt can get into the working parts which are enclosed in a fabric bag and the instrument can not foul its own moorings as it rides over them at slack water or change of tidal direction. (Ensign-PAI)

AN ECOLOGICAL STUDY OF THREE FRESH WATER PONDS OF HYDERABAD-INDIA: IL THE ENVIRONMENT, Oamania Univ., Hyderabad (India). Hydrobiology

Lab

For primary bibliographic entry see Field 05C. W73-10625

RANUNCULUS FLUITANS LAMARCK IN LYON, C. Forestie

Bull Mens Soc Linn Lyon. Vol 41, No 6, p 120-124. 1972. Illus.

Identifiers: *France (Lyon),
*Ranunculus-Fluitans, *Rhone River. Putrefaction.

The presence of R. fluitans in the Rhone River at Lyon (France), where it has been spreading remarkably for 2 or 3 yrs. is reported for the first time. The cause of this invasion was attributed to the action of the Pierre-Benite hydroelectric dam which reduced the water flow rate and limited the low water phenomena that used to occur frequently in times of little rainfall. The colonization of this plant does not present any threat to navigation in this case, although it may cause an accumulation of debris and various objects to areas where colonization is heavy. However, destruction of these plants would be unwise since they play an important role in the degradation of putrid matter released into the slowed-down currents.—Copyright 1973, Biological Abstracts, Inc. W73-10646 The presence of R. fluitans in the Rhone River at

SOME ECOLOGICAL ASPECTS OF A NEST-ING COLONY OF HERONS,

Auburn Univ., Ala.
For primary bibliographic entry see Field 02H.

ACCUMULATION OF FALLOUT CESIUM 137 IN SOILS AND SEDIMENTS IN SELECTED WATERSHEDS, Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

Agricultural Research Service, Oxford, Miss. Sedimentation Lab. J. R. McHeary, J. C. Ritchie, and A. C. Gill. Water Resources Research, Vol 9, No 3, p 676-686, June 1973. 3 fig, 9 tab, 17 ref. AEC-AT (49-7)-

Descriptors: *Tracers, *Sedimentation, *Fallout, *Cesium, Reservoirs, Bottom sediments, Sampling, Erosion, Soil erosion, Sediment yield, Radioactivity techniques, Adsorption, Path of pollutants, Radioisotopes.

Identifiers: Gamma ray spectrography.

Identifiers: Gamma ray spectrography.

The fallout of radioisotopes produced in nuclear explosions provides tracers for following the movement of soil particles in the sedimentation cycle. Cesium 137, which is strongly adsorbed by most soil particles, was identified in sampled soils and sediments. The concentration of Ca-137 ranged from 0.01 to 3.28 pc/lg in soils and from 0.01 to 10.05 pc/lg in sediments. Uranium, thorium, and potassium were determined simultaneously with Ca-137. Total potassium ranged from a tracr to 5.4%, uranium from 0.5 to 9.4 ppm, and thorium from 1.9 to 42.0 ppm. The concentration of Ca-137 in reservoir sediments varied with depth. In some reservoirs the years of greatest Ca-137 fablout were correlated with layers containing peak concentrations of Ca-137 in sediments was significantly correlated with the amount of Ca-137 was concentration factor was as large as 24. This accumulation of Cs-137 in reservoir sediments is indicative of the pollution possible in reservoirs as a result of fallout within the watershed but not necessarily within the reservoir. (Knapp-USGS) W73-10667

CHLORIDE BALANCE OF SOME FARMED AND FORESTED CATCHMENTS IN SOUTHWESTERN AUSTRALIA, Commonwealth Scientific and Industrial Research

Organization, Wembley (Australia).
For primary bibliographic entry see Field 02K.

LEAD OUTPUTS IN STREAMFLOW FROM A WATERSHED ECOSYSTEM, Illinois Univ. Urbana, Dent. o

Illinois Univ., Urbana, Dept. of Forestry.
G. Rolfe, and J. Edgington.
Water Resources Bulletin, Vol 9, No 2, p 372-375, April 1973, 1 fig. 1 tab.

Descriptors: *Lead, *Path of pollutants, Urban hydrology, *Illinois, Water pollution sources, En-vironmental effects, Data collections, Hydrologic data, Water quality.
Identifiers: *Champaign-Urbana (III).

Identifiers: "Champaign-Urbana (III).

The movements and effects of lead are studied in an 86 sq mi watershed ecosystem at Champaign-Urbana, Illinois. The objectives are to understand and mathematically model the movements and effects of lead in an ecosystem. The system is drained by the Saline Branch Drainage Ditch, a rural stream draining the agricultural area to the north of the cities and Boneyard Creek, an urban stream draining Champaign and Urbana. The two streams join on the northeast edge of Urbana and leave the watershed on its southeastern edge. Lead emitted through the combustion of gasoline containing tetraethyl lead is considered the predominant source (95%) of lead input to the ecosystem. Preliminary estimates, based on traffic volumes and gasoline consumption, indicates approximately 2,340 kg of lead input to the ecosystem every 30 days. Approximately 70% of these emissions occur in the Urbana-Champaign area. The primary avenue of exit for lead from the watershed is through streamflow, including lead associated with suspended sediments. Only about 2%-3% of the lead input is exiting through the water system. This indicates a large buildup of lead in ecosystems of this type. Possible accumulation points in the ecosystem include stream-bottom sediments, soils, and biota. (Knapp-USGS)

PRECISE WATER VELOCITY MEASURE-MENTS USING PHOTOGRAMMETRIC

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MENTS USING PHUTUS AND TECHNIQUES, TECHNIQUES, Madison, Dept. of Civil and En-Wisconssia Ungineering, vironmental Engineering, P. R. Wolf, and T. J. Keating. Water Resources Bulletin, Vol 9, No 2, p 312-319,

Water Resources Bulle April 1973. 3 fig, 6 ref.

Descriptors: "Mixing, "Currents (Water), "Thermal pollution, "Photogrammetry, "Aerial photoraphy, Velocity, Streamflow, Heated water, Remote sensing, "Lake Michigan.

Horizontal surface and subsurface water velocities in thermal plumes were studied using time lapse serial photography and analytical photogrammetric techniques. Drogues were placed in an effluent plume. Photographic coordinates of drogue images were measured using a glass scale. From the photo coordinates and the results of a groud control survey, positions of drogues in the water were analyzed at known intervals of time. Drogue positions were mapped for selected exposures thereby providing a visual display of velocity vectors in the study area. A rigorous error analysis was performed to determine the validity of the computed results. (Knapp-USGS)

OIL ON PUGET SOUND, AN INTERDISCIPLI-NARY STUDY IN SYSTEMS ENGINEERING, Washington Univ., Seattle. Coll. of Engineering. J. Vagners, and P. Mar. Available from NTIS, Springfield, Va., 22151 as COM-72-11251. Price \$9.00 printed copy, \$0.95 microfiche. Washington University Press, Seattle, 1972. 648 p. 114 fig, 58 tab, 91 ref, 14 append.

Descriptors: *Oil spills, *Water pollution sources, *Sounds, *Washington, *Water pollution control, Water quality, Ecosystems, Aquatic life, Oil industry, Oil pollution, Oily water, Pollution abatement, Path of pollutants, Winds, Currents (Water), Reviews, Publications, Bibliographies, Industrial wastes.
Identifiers: *Puget Sound (Wash).

A six-month interdisciplinary course was formulated to study the prevention and control (containment and cleanup) of oil spills in Puget Sound. The report evaluates the current status of oil spill prevention and control in Puget Sound and suggests recommendations to alleviate any noticeable deficiencies. Section one presents information on the oil spill statistics and notes on prevention and control. The second section presents a description of Puget Sound and its industries. The third section deals with the prevention and control of oil spills. A bibliography and a list of sources of unpublished information are included. Fourteen appendices contain supportive information and data. (Woodard-USGS) pendices contain s (Woodard-USGS)

NOTES ON DEVELOPING GROUND WATERS, International Water Supply Association, Montreal (Quebec).

For primary bibliographic entry see Field 04B. W73.10711

WHAT IS THE ROLE OF FLOOD FLOWS IN THE POLLUTION OF THE CONNECTICUT RIVER AND ITS AMELIORATION,

RIVER AND ITS AMELIORATION,
Massachusetts Univ., Amherst.
C. J. Libbey, and W. Litaky.
In: Formation of Public Policy on Issue of Out-ofState Basin Diversion of Connecticut River Flood
Waters to Boston Metropolitan Area. Massachusettis Water Resources Research Center,
Publication No. 25, 1973. Appendix E, 14 p, 5 fig, 2
tab. OWRR C-2169 (No. 3377) (1).

Descriptors: *Water quality, *Regression analysis, Coliforms, Suspended solids, Flood flow, Urban

runoff, Runoff, Biochemical oxygen demand, *Connecticut River, *Diversion, *Inter-basin transfers, Massachusetts. Identifiers: Enfield Dam, Northfield (Mass.).

Identifiers: Enfield Dam, Northfield (Mass.).

This appendix provides an analysis of available data on BOD, suspended solids, and coliform concentrations in relation to river flows for the Connecticut River. Storm or flood flows not only provide more water for the dilution of pollutants but also contribute large quantities of pollutants but also contribute large quantities of pollutants as they flush urban and rural lands and cause combined sewer overflows. Thus, the diversion of flood waters may have a significant effect on river water quality. Data from the Connecticut River at the Enfield Dam and at Northfield were studied using regression analysis and several graphs and tables are presented. The findings include: (1) Enfield which is below sewage treatment plants had high levels of BOD and coliform concentrations while Northfield which is in an agricultural area had high levels of suspended solids; (2) the BOD coliform levels varied inversely with the river flows; (3) the proposed diversion of flood waters will be an important factor in the quality of the river flow but the exact effects can not yet be estimated; and (4) a comprehensive river sampling nver how out me exact effects can not yet oc estimated; and (4) a comprehensive river sampling program is needed. (See also W73-10726). (Elfers - North Carolina). W73-10731

SALINITY PROBLEMS OF IMPOUNDMENTS AND THEIR MANAGEMENT, Agricultural Research Service Chickasha, Okla. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05G. W73-1073

GROUNDWATER RESOURCES OF COKE COUNTY, TEXAS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 04B.

DYNAMICS OF MINERAL AND ORGANIC PHOSPHORUS IN THE SEA OF AZOV AFTER, REGULATION OF DON RIVER FLOW OINAMIKA MINERAL'NOGO I ORGANICHESKOGO FOSFORA V AZOVSKOM MORE POSLE ZAREGULIROVANIYA STOKA
REKI DONA),
Basseinovaya i Gidrometeorologicheskaya Observatoriya Chernogo i Azovskogo Morei, Sevastopol
(USSR).

For primary bibliographic entry see Field 02K. W73-10782

'IRON WATER' FROM WELLS: CAUSES AND PREVENTION, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 04B.

SURVIVAL OF MAIZE BACTERIAL STALK ROT PATHOGENS IN INFECTED TISSUE UNDER DIFFERENT MOISTURE AND TEM-PERATURE CONDITIONS, Udaipur Univ. (India). Agricultural Experiment Station. For primary bibliographic entry see Field 03F. W73-10800

STUDY ON THE ACOUSTIC CHARAC-TERISTICS OF UNDER-WATER: FLOATING MUD-1, (IN JAPANESE), Tokai Univ., Tokyo (Japan). Coll. of Marine Science and Technology. K. Ogawa, A. Tsuchiya, and M. Nishimura. J Coll Mar Sci Technol Tokai Univ. 6. p 1-17. 1972. Illus. English summary.

Identifiers: Acoustic studies, Coastal waters,
*Japan, Method, *Mud (Floating), Pollution, Sea
water, Ultrasonics, Water pollution sources.

Floating mud is a pollution factor in coastal sea water around Japan. Since composition and dis-tribution of particles contained in the floating mud water around Japan. Since composition and distribution of particles contained in the floating mud layer may vary depending on time, location and sea state, the usual marine observation method which requires much time and effort should not be effective to determine and analyze behavior of floating mud layer. To resolve such problems, an ultrasonic reflection method was developed to detect and to observe the floating mud layer. Tank and field experiments indicate that echoes of floating mud layer correspond closely to the underwater optical, thermal or chemical vertical distribution. The dependence between decrease of acoustic reflection loss on floating mud layer and increase of acoustic frequency as well as concentration of floating mud is observed. Similar relationship for acoustic reflection loss is calculated through Ament's theoretical formula giving the value of density and acoustic velocity of the sample collected in sea water. Concentration of floating mud layer can be evaluated by measuring acoustic reflection loss of this layer.—Copyright 1973, Biological Abstracts, Inc. 1973, Biological Abstracts, Inc. W73-10803

GROUNDWATER CONTAMINATION IN THE CORTARO AREA, PIMA COUNTY, ARIZONA, Harshbarger and Associates, Tucson, Ariz. K. D. Schmidt.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assa., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 95-111, (1972). 5 fig, 9 ref.

Descriptors: "Groundwater, "Water pollution, "Nitrates, "Irrigation wells, "Sewage disposal, Sewage treatment, Effluents, Groundwater recharge, Sewage lagoons, Sanitary engineering, Landfills, Septic tanks, Agricultural runoff, Geologic investigations, Flow nets, Analysis, Chlorides, Water wells, Seasonal, Hydrographs, Water management (Applied), Arizona, Arid lands.

lands.

High concentrations of nitrate have been found in water samples from irrigation wells north of the Tucson Arizona Sewage Treatment Plant. The plant, which had primary treatment prior to 1951, produced 2,800 acre-feet of effluent in 1940, 4,600 acre-feet in 1950, 16,300 acre-feet in 1960, and 33,000 acre-feet in 1970. Large amounts of treated effluent recharge the groundwater system north of the plant. Sources of nitrate contamination beside sewage effluent may be sewage lagoons, sanitary landfills, meat packing and dairy effluent, septicanks, and agricultural runoff. Sewage effluent is considered to be the primary source of nitrate contamination in the area. Geologic and flow net analysis indicate that squifer conditions minimize the effects of sewage effluent contamination. Chloride and nitrate migration appears to be similar in the aquifer. Large-capacity wells were sampled to reflect regional conditions, and chemical hydrographs of chloride and nitrate were analyzed. The seasonal nature of these hydrographs patterns depend on total nitrogen in sewage effluent. Management alternatives are suggested to decrease nitrate pollution by sewage effluent. (See also W73-10818) (Popkin-Arizona)

OCCURRENCE OF SOME CHLORINATED ALIPHATIC HYDROCARBONS IN THE EN-

ALIPHA IL BURCHER VIRONMENT, The Univ. (England). Dept. of Oceanography. A. J. Murray, and J. P. Riley. Nature, Vol 242, No 5392, p 37-38, March 2, 1973.

Descriptors: Water analysis, "Sea water, "Pollutant identification, Organic compounds, Ecological distribution, Chemical analysis, Methodology, Atlantic Ocean, Air pollution, Water pollution, Identifiers: "Electron capture gas chromatography, "Chlorinated hydrocarbons, Sample preparation, Accuracy, Methyl chloride, Chloroform, Carbon tetrachloroide, Trichloroethylene, Tetrachloroethylene.

Preliminary data are presented on the environmental (air and water) distribution of aliphatic chlorocompounds. The chlorinated hydrocarbons are stripped from 10- to 100-ml water samples by bubbling with nitrogen and are retained in a cooled silicone packed trap for analysis by electron capture gas chromatography. The coefficient of variation of the method was less than 15 percent. Analyses carried out on samples of surface waters from the North East Atlantic abowed the presence of significant amounts of the same principal chlorinated hydrocarbons that were detected in the air samples. (Holoman-Battelle)

HEAVY METALS IN BRITISH WATERS, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab. Nature, Vol 242, No 5393, p 95-97, March 9, 1973. 1 fig, 4 tab, 15 ref.

Descriptors: "Heavy metals, "Sea water, "Path of pollutants, Research and Development, Distribution, Copper, Manganese, Nickel, Lead, Zinc, Copper, Cadmium, Commercial fish, Commercial shellfish, Atlantic Ocean, Marine fish, Metabolism, Kinetics, Ecological distribution.
Identifiers: "England, "Coastal waters, "Pate of pollutants, Seaham Harbor, Irish Sea, Severa Estuary, Fucus, Muscle, Marine environment.

Estuary, Fucus, Muscle, Marine environment.

The program of research and development on heavy metals in the marine environment, conducted by the Ministry of Agriculture, Fisheries and Food, has two chief objectives: (1) the establishment and continued monitoring of concentrations in fish and shellfish of commercial importance in Britain to provide a basis for estimates of human intake of heavy metals and (2) to provide data to assist an understanding of the behavior of heavy metals when they are introduced into the marine environment—the factors determining their geographical distribution, or biological fate, including their effect, if any, on marine resources and the kinetics of their metabolism in representative marine organisms. The results of seawater sampling on a pilot scale around the British Isles show that contamination is restricted to a few areas, chiefly, but not exclusively, linked to industrial development, and that even in these areas contamination does not spread very far offshore. Monitoring of commercial fish species shows that, except for sedentary shellfish, variations in inshore seawater metal concentrations are not reflected to any great extent in the edible portions of these species. Of course concentrations in inshore fish are sometimes higher than those in offshore fish, especially in the case of Cd, Hg, and Pb. This strongly indicates that metal pollution problems are essentially national or regional problems. (Holoman-Battelle)

MICRODETERMINATION OF FORMIC, OXAL-IC AND ACETIC ACIDS IN THEIR MIXTURE BY SELECTIVE OXIDATION, Allahabad Univ. (India). Chemistry Labs. For primary bibliographic entry see Field 05A. W73-10860.

THE DISTRIBUTION OF HEAVY METALS IN SEDIMENTS OF SORFJORD, WEST NORWAY, Edinburgh Univ. (Scotland). Grant Inst. of Geolo-

Group 5B-Sources of Pollution

J. M. Skei, N. B. Price, S. E. Calvert, and H.

Water, Air, and Soil Pollution, Vol 1, No 4, p 452-461, September 1972. 7 fig, 5 tab, 15 ref.

Descriptors: "Heavy metals, "Bottom sediments, "Soil analysis, "Pollutant identification, "X-ray fluorescence, Distribution, Sampling, Aquatic soils, Chemical analysis, Fjords, Cadmium, Copper, Lead, Zinc, Cores, Water pollution sources, X-ray analysis. Identifiers: "Norway (Sorfjord), Silver, Barium, Bismuth, Indium, Antimony, Tin.

Sediment cores were taken from 16 sites in Sorfjord, West Norway and frozen. The surface 2-cm
sections were sampled, dried, and ground for
chemical analysis by X-ray fluorescence for the
presence of Ag, Ba, Bi, Cd, Cu, In, Pb, Sb, Sa,
and Zn. Unusually high concentrations were
found; the concentrations of Zn and Pb reached
approximately 10 percent by weight in some sediments. The concentrations of most of the elements
were positively correlated, those of Pb, Cd, and
Cu with Zn being particularly well developed; correlations also existed between Sb and Zn, and Ag
and Cu. The concentrations of the metals in the
bottom sediments decreased southwards and
northwards from a locality close to a source of industrial waste. (Holoman-Battelle) W73-10865

ABSORPTION OF AMMONIA FROM AT-MOSPHERIC PLUMES BY NATURAL WATER

SURFACES, National Environmental Research Center, Research Triangle Park, N.C. K. L. Calder.

Water, Air, and Soil Pollution, Vol 1, No 4, p 375-380, September 1972. 1 fig, 5 ref.

Descriptors: *Ammonia, *Absorption, *Mathematical models, *Path of pollutants, Model studies, Diffusion, Gases.
Identifiers: *Atmospheric transport, *Water sur-

A simple model is presented that incorporates the major features of atmospheric transport and diffusion of a NH3 plume together with aqueous aborption as the plume traverses a water surface. The model is based on the well-known concept of the deposition velocity, although empirical data concerning the latter is quite meager. A specific application is considered to the gas release from a NH3 stripper of a hypothetical sewage treatment. NH3 stripper of a hypothetical sewage treatment plant, and it is concluded that NH3 absorption by adjacent water masses could be cons (Holoman-Battelle)

HALOGENATED HYDROCARBONS IN AND OVER THE ATLANTIC,

Reading Univ. (England). Dept. of Applied Physi-

J. E. Lovelock, R. J. Maggs, and R. J. Wade. Nature, Vol 241, No 5386, p 194-196, January 19, 1973. 2 fig, 1 tab, 6 ref.

Descriptors: "Water pollution, "Water analysis,
"Sea water, "Atlantic Ocean, Air pollution, Gases,
Organic compounds, Pollutant identification,
Water pollution sources, Ecological distribution.
Identifiers: "Halogenated hydrocarbons, "Electron capture gas chromatography, Methyl iodide,
Carbon tetrachloride, Aliphatic hydrocarbons,
Valomethanes

A study conducted to compare the observed global A study conducted to compare the observed global distribution of CC13F (a propellant solvent) with the predicted distribution from models of the behavior of an ideal inert gas revealed two halomethanes: methyl iodide and carbon tetrachloride. These 2 compounds and CC13F were uniformly distributed both in air and sea. Analyses were made by gas chromatography using a new electron capture detector which is capable of coulometric measurements. All three gases were found in the air and in the sea wherever and whenever they were sought. CC13F is one of the few substances present and easily measured in the air which is wholly anthropogenic in origin. CH31 is probably a singular product of marine biology and may be a key compound in the natural cycle of iodine between the seas and the land. CC14 seems very likely to be a product of natural inorganic chemistry, possibly the reaction of methane in the troposhere with chlorine in a complex sequence of reactions. This substance also is passed through the environment in quantities exceeding 1 megaton annually. (Holoman-Battelle)

DISTRIBUTION OF VIBRIO PARAHAEMOLYTICUS IN THE NATURAL EN-

PARABLEMOLTTICUS IN THE NATURAL EN-VIRONMENT,
Washington Univ., Seattle. Inst. for Food Science and Technology.
J. Liston, and J. Baross.
Journal of Milk and Food Technology, Vol 36, No 2, p 113-117, February 1973. 5 tab, 35 ref.

Descriptors: *Distribution patterns, *Water pollution effects, Water pollution sources, Path of pollutants, Shellfish, Foods, Sea water, Estuarine enlutants, Shellfish, Foods, Sea water, Estuarine en-vironment, Water temperature, Population, Seu-ments, Plankton, Fish, Organic matter, Oysters, Shrimp, Crabs, Clams, Public health, Coasts, Pacific Ocean, Atlantic Ocean, Reviews, Gulf of Mexico, Pathogenic bacteria, Enteric bacteria, Marine bacteria, Indian Ocean, Hawaii, Australia, Marine bacteria, Indian Ocean, Hawaii, Australia, Identifiers: "Vibrio parahaemolyticus, "Tissue, "Macroinvertebrates, Japan, China Sea, Korea, Taiwan, Ceylon, Germany, Denmark, Holland, England, Baltic Sea, Adviatic Sea, France, Spain, Phillipines, India, China.

Vibrio parahaemolyticus has been isolated widely from marine environments but appears to be most abundant in inshore and estuarine areas when ambient temperatures rise seasonally to levels permitting growth of the organism. Japanese and U.S. studies of coastal areas have shown a direct relationship between temperature and abundance of Vibrio parahaemolyticus and this correlates with the seasonal incidence of Vibrio parahaemolyticus food poisoning in Japan. The organism has been isolated from water, sediment, plankton, fish and shellfish. In North America it seems to be most abundant in molluscan shellfish and in waters of shellfish. In North America it seems to be most abuldant in molluscan shellfish and in waters of high organic content. Counts of 10-200/ml of water, 1-7/g of sediment and up to 100,000/g of oyster tissue have been reported for North American inshore areas. Limited information on market seafood samples indicates very low incidence of Vibrio parahaemolyticus on fin fish in Europe and North America and high incidence in Japan during summer months. Limited data on market samples of frozen and fresh shellfish in U.S.A. suggest sporadically high incidence on shrimp, crabmeat, oysters, and clams. (Little-Battelle) W73-10875

ECOLOGICAL SIGNIFICANCE OF THE DISCHARGE OF TREATED WASTE WATERS INTO COASTAL WATERS, Southern California Coastal Water Research Project Los Appeles

ject, Los Angeles.
For primary bibliographic entry see Field 05C.
W73-10876

CORRELATED STUDIES OF VANCOUVER LAKE-HYDRAULIC MODEL STUDY, Washington State Univ., Pullman. R.L. Albrook Hydraulic Lab.

Hydrauuc Lab.
J. F. Orsborn.
Copy available from GPO Sup Doc as
EP1.23/2:72-078, \$1.25; microfiche from NTIS as
PB-221 248, \$0.95. Environmental Protection
Agency, Technology Series Report EPA-R2-72-

078, October 1972. 64 p, 30 fig, 3 tab, 35 ref. EPA Project 16080 ERP.

Descriptors: *Hydraulic models, *Computer models, Lakes, Tidal effects, Eutrophication, Water resource development, *Columbia River, Water quality, Washington, Path of pollutants. Identifiers: *Lake restoration, Enhancement,

The effects of possible modifications to the Van-couver Lake-Columbia River System on the hydraulic characteristics of that system were tested in a physical hydraulic model. A mathemati-cal model was developed for predictive analysis and to expand the results of the hydraulic model study. Alternate methods for improving flushing action through Vancouver Lake by use of a con-duit were investigated. The theories, assumptions, test procedures, data analysis and results as duit were investigated. The theories, assumpuons, test procedures, data analysis and results as presented are directed towards arriving at conclusions and recommendations regarding proposed hydraulic regime and water quality conditions in Vancouver Lake. The tests were conducted to determine the hydraulic characteristics and the flushing efficiency of pollutants by using a fluorescent dye to simulate the soluble conservafluorescent dye to simulate the soluble conservative pollutants in the prototype. In addition, the
hydraulic model study provided information on
the dispersion, mixing, dilution rates and detention
times which are important factors influencing
water quality. This is Part 1 of a two-part study entitled 'Correlated Studies of Vancouver Lake,
Washington. The other part of the study is Water
Quality Prediction conducted by the Sanitary Engineering Section of the College of Engineering
Research Division at Washington State University
under Project No. 16080 ERQ, details of which are
covered in a senarate report (EPA) (See also W73covered in a separate report. (EPA) (See also W73-10882) W73-10881

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CORRELATED STUDIES OF VANCOUVER LAKE - WATER QUALITY PREDICTION STU-

DY, Washington State Univ., Pullman. Dept. of Civil

Engineering. S. K. Bhagat, W. H. Funk, and D. L. Johnstone. Copy available from GPO Sup Doc as EPI.23/2:72-111, \$2.00; microfiche from NTIS as PB-221 249, \$0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-111, November 1972. 97 p, 29 fig, 6 tab, 7 ref. EPA Project 16080 ERQ.

Descriptors: Water Quality, *Simulation analysis,
*Water Quality Control, Eutrophication,
*Dredging, Mud, Washington, *Hydraulic models,
*Computer models, Bottom sediments. Identifiers: *Lake restoration, Lake flushing, *Vancouver Lake (Wash).

This study deals with the restoration of water quality of shallow, polluted, and eutrophic lakes. Dredging and removing of lake bottom sediments and introducing better quality water are the restoration measures explored. Vancouver Lake, Washington, was used as a test case. Hydrologic, hydrographic, hydrodynamic, and water quality information, provided by separate but correlated studies, was combined with the aid of mathematistudies, was combined with the aid of mathematical simulation models. Dissolved oxygen was used
as an indicator of the overall water quality in the
system. Photosynthesis, atmospheric reaeration,
biological respiration, and advection were
mechanisms considered in the computation of
diurnal changes in dissolved oxygen level. In addition to the DO model, the aquatic life model for
computing time-varying levels of phytoplankton
and bacteria was also tried. The validity of these
models was verified with the actual field data models was verified with the actual field data. After verifications of the models under the existin

UNRECORDED POLLUTION SOURCES AND UNRECORDED POLLUTION SOURCES AND OPTIMUM WATER QUALITY SYSTEMS, Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst. W. Whipple, Jr., J. V. Hunter, and S. L. Yu. In: Proceedings of a national symposium, 'Costs of Water Pollution Control,' North Carolina Research Triangle Universities and Environmental Protection Agency, Raleigh, North Carolina. April 6, 7, 1972, p 101-113 (1972). A-025-NJ (2).

Descriptors: *Organic loading, *Urban runoff, Water quality, Water pollution sources, *New Jer-sey, *Biochemical oxygen demand, Municipal

sey, "Biochemical oxygen demand, Municipal wastes, Industrial wastes. Identifiers: "Mass balance analysis, "Unrecorded waste loading, "Water quality modelling, Un-recorded pollution, Nonpoint pollution sources.

recorded pollution, Nonpoint pollution sources. It is coming to be generally recognized that there are very large waste loadings in rivers in developed areas, over and above the recorded treatment plant effluents. The origins of unrecorded pollution in developed areas, the policy implications for regional water quality planning, and the method of modelling organic pollution by means of BOD mass balance analysis are discussed. Some 'background' waste loading occurs even in totally undeveloped areas. In level cropped areas and areas of individual family housing in New Jersey, BOD concentrations in dry weather averaged less than 2.0 mg/l and in wet weather less than 3.0 mg/l. In a residential area which has considerable industry, unrecorded dry weather BOD concentrations averaged 9 mg/l and wet weather BOD 17 Mass balance analysis will usually be required in order to determine unrecorded BOD in urban areas, unless the entire watershed is urban. The process is basically simple, but, for accuracy, account should be taken of the deviations of the BOD rate from the usually assumed first order reaction.

PESTICIDE-SEDIMENT-WATER INTERAC.

TIONS, Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research

Center.

H. B. Pionke, and G. Chesters.

Journal of Environmental Quality, Vol 2, No 1, p
29-45 January-March, 1973. 9 fig, 1 tab, 150 ref.

OWRR B-016-WIS (16). ARS 12-14-100-8154 (41).

Descriptors: *Pesticides, *Sediments, Aquatic soils, Water pollution sources, Limnology, Aquatic plants, Balance of nature, *Sediment-water interfaces, *Lake sediments, *Reviews.

Pesticide-sediment-water interactions occurring within a watershed and the associated aquatic system are reviewed regarding their impact on the distribution and persistence of pesticides in recipient lakes. Pesticidal persistence on the watershed is discussed initially because the aquatic residue hazard depends largely on the persistence of soil-applied pesticides. Mechanisms of transport from field to aquatic system are reviewed for those compounds not degraded rapidly to nontoxic derivatives. Pesticide transport through the atmosphere, ground water, and surface runoff is traced with particular emphasis on application-associated losses and transport effect application-associated losses and transport effect on initial pesticide distribution and concentration in the aquatic system. Field and plot studies evaluating pesticide losses in runoff are sum-marized. Within the aquatic system, limnological, marized. Within the aquatic system, immological, sediment and water characteristics potentially alter the distribution of adsorbed pesticide between water and associated sediment within the lake. Specifically, the effects of pH, lake stratification, characteristics and content of sediment organic matter and clay, and salimity are evaluated. This review concluded with a discussion of literature on pesticide persistence determined in simulated or natural aquatic systems and the interaclated or natural aquatic systems and the interactions between aquatic vegetation, sediment, and water which affect pesticide distribution. W73-10892

A NOTE ON THE PREDICTION OF BOD PROFILE DUE TO A SOURCE OF EFFLUENT DISCHARGED IN A UNIFORMLY FLOWING

DISCHARGED IN A UNIFORMLY FLOWING STREAM, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.

Water Research, Vol 6, No 7, p 749-757, 1972. 3

Descriptors: *Diffusion, *Mathematical models, *Biochemical oxygen demand, *Effluents, Streams, Flow profiles, Velocity, Distance, Dispersion, Width, Pollutants, Equations. Identifiers: Point source model, Plug flow model,

Discharge from a source of pollutant into a uniform stream is analyzed using the two-dimen-tional diffusion equation with a source of finite width and uniform concentration. Neither the point source model nor the plug flow model can give accurate enough predictions until the concen-tration has been reduced to a small fraction of the initial value. The danger of not using the proper source strength when applying the point source and plug flow solutions is illustrated. Very close to the source, the plug flow solution can be used to approximate the maximum concentration assur approximate the maximum concentration assum-ing a certain source of concentration across the whole river. If the effluent concentration is high enough so that far downstream, after the pollutant has essentially dispersed, the concentration level is still significant, the plug flow model can again be used. The distance required for lateral mixing is dependent upon stream characteristics and width of source. It also varies with degree of cross-stream variation one can tolerate. Although the plug flow model can give satisfactory approxima-tion under special circumstances, the finite width source solution should be used since the expression is still very simple and the error function has been well tabulated. (Jones-Wisconsin) W73-10937

RELEASE OF AMMONIUM-N FROM SEDI-MENTS TO WATERS,
Wisconsin Univ., Madison. Dept. of Soil Science.

B. H. Byrnes, D. R. Keeney, and D. A. Graetz.
International Association of Great Lakes
Research, Proceedings 15th Conference on Great
Lakes Research, p 249-259, 1972. 3 fig, 7 tab, 13

Descriptors: *Ammonia, *Sediments, *Freshwater, Lakes, Wisconsin, Eutrophication, Nitrogen, Nutrients, Sediment-water interchange. Identifiers: Lake Mendota (Wis.), Lake Tomahawk (Wis.).

Lboratory and field investigations of the rate of NH4-N movement within freshwater lake sedi-ment profiles and transformations within and release of NH-4N to waters from sediments were conducted on Lake Mendota, a moderately eutrophic hard water lake in southcentral Wiscon-sin and on Lake Tomahawk, an oligotrophic lake in northeastern Wisconsin. The results of this investigation indicate that: (a) the exchange sequence: interstitial H2O NH4-N and lake H2O sequence: interstuna 1720 1714-79 and take 1 considered as a source of NH4-N to the overlying waters. (Keeney-Wisconsin)

SIMPLIFIED METHOD OF OCEAN OUTFALL SIMPLIFIED MEANLYSIS, DIFFUSER ANALYSIS, (James M.) Consulting Engineers, DIFFUSER ANALUSES,
Montgomery (James M.) Consulting Engineers,
Inc., Pasadena, Calif.
J. L. Chao, and C. M. Campuzano.
J Water Pollut Control Fed. Vol 44, No 5, p 806-812, 1972. Illus.

Identifiers: *Diffusion, Discharge (Waste water), Ocean, *Outfall, Waste water disposal.

A simplified method of calculating friction loss through a (wastewater) diffuser with a continuous lateral discharge was developed. This method is especially useful during the preliminary planning stage of an engineering project. It can be applied to diffusers with uniform, stepwise and uniformly varying discharges from their ports. Accuracy of the simplified method was verified with existing data to a satisfactory degree.—Copyright 1972, Biological Abstracts, Inc. W73-10948

ON THE ISOLATION AND THE BACTERIOLYTIC ACTIVITY OF SOME MYX-OBACTERIA ISOLATED IN WATER (SUR L'ISOLEMENT ET L'ACTIVITE BACTERIOLYTIQUE DE QUELQUES MYXOBACTERIES ISOLEES DE L'FAUI, Institut Pasteur, Lille (France). Laboratoire d'-

Hydrobiologie.
For primary bibliographic entry see Field 05A.
W73-10999

EXPERIMENTAL TREATMENT OF SURFACE WATER PURIFICATION BY LAGOONS: CHEMICAL AND MICROBIOLOGICAL ASPECTS, (TRAITEMENT EXPERIMENTAL D'EPURATION D'UNE EAU DE SURFACE PAR ANTRACE. ASPECTS CUINIQUIES PER ANTRACE. D'EPURATION D'UNE EAU DE SURFACE PAR LANUNAGE: ASPECTS CHIMIQUES ET MICROBIOLOGIQUES), Institut Pasteur, Lille (France). Laboratoire d'-Hydrobiologie. J. Walker, and H. Leclerc. Water Research, Vol 7, No 5, p 707-728, May 1973. 14 fig, 6 tab, 48 ref.

Descriptors: Methodology, *Chemical properties, *Lagoons, *Water pollution, *Isolation, Microbiology, *Pollutant identification, Bioindicators, Chemical analysis, Dominant organisms, Water treatment, Rivers, Water analysis, Pseudomonas, Enteric bacteria, Dissolved oxygen, Suspended solids, Biochemical oxygen demand, Ammonia, Nitrites, Nitrates, Phosphates, Detergents, E. coli, Coliforms, Clostridium, Pathogenic bacteria, Aerobic bacteria, Anaerobic bacteria, Aerobic bacteria, Anaerobic bacteria, Identifiers: *Bacterial populations, Enterobacteriaceae, Aeromonas, Achromobacter, Flavobacterium, Xanthomonas, Cytophaga, Fecal pollution, Potassium permanganate consumption, Orthophosphates, Carbon chloroform extract, Organic nitrogen, Fecal streptococci.

Polluted river water was treated by lagooning in an experimental bed. The evolution of the most representative parameters of the organic and bacterial pollution has been studied in relation to the ternal pollution has been studied in relation to the period of retention. The predominant bacterial populations have been identified and their qualita-tive and quantitative variations have been related to the degree of pollution. The analytical results are commented upon and the advantages of the method are stressed. (Holoman-Battelle)

A PRELIMINARY INVESTIGATION OF OR-

A PRELIMINARY INVESTIGATION OF OR-GANIC-INORGANIC ASSOCIATIONS IN A STAGNATING SYSTEM, Georgia Univ., Athens. Dept. of Zoology. J. E. Schindler, J. J. Alberts, and K. R. Honick. Limnology and Oceanography, Vol 17, No 6, p 952-957, November 1972. 5 fig, 1 tab, 11 ref. OWRR A-029-GA (6).

Group 5B—Sources of Pollution

Descriptors: "Sediments, "Sediment-water interfaces, "Oxidation-reduction potential, "Heavy metals, Sorption, "Hydrogen ion concentration, Pittration, Iron, Zinc, Manganese, Magnesium, Sampling, Separation techniques, Path of pollutants, Water analysis, "Georgia. Identifiers: "Molecular weight fractionation, Transport, Membrane filters, Mobilization, Organic carbon, "Lago Pond (Geo).

Undisturbed water samples were collected from Lago Pond in Georgia using a free-fall corer fitted with a plastic insert which could be easily removed and serve as a microcosm of the sediment for use in molecular weight fractionation studies. The purpose was to examine the possibility of organic-incrpanic complex formation as a mechanism for mobilization of metals during stagnation of a lake sediment system. Portions of the samples were withdrawn at various locations and at certain intervals based on redox potentials and pH values. The portions were passed through membrane filters which retained material with molecular weights of 100,000, 50,000, 10,000, 2,000, and 50. Replicate aliquots of water fractions were analyzed for orwhich retained material with molecular weights of 100,000, 50,000, 10,000, 2,000, and 50. Replicate aliquots of water fractions were analyzed for organic carbon. The remainder of each water fraction was analyzed for Fe, Mg, Mn, and Zn by AA. Unfiltered samples were analyzed for organic carbon and the aforementioned metals. The concentration of each element retained in the molecular weight fractions was calculated by subtracting from the concentration in the next larger size sample. Total inorganic carbon of the aqueous phase was determined by infrared gas analysis. The results showed that (1) inorganic carbon increased during reduction; (2) organic carbon increased during reduction; (3) Fe, Mg, and Mn were associated with the 10,000-50,000 molecular weight fraction during reduction; and (4) only Zn was associated with the 0-500 molecular weight fraction. It is suggested that the association of the elements studied with colloid-forming materials could impart a stability which would permit their transport to oxygen-rich, productive areas of lakes. (Little-Battelle) W73-11004 W73-11004

DISSOLVED OXYGEN AND TEMPERATURE IN A STRATIFIED LAKE, Oregon State Univ., Corvallis. Dept. of Civil En-

Oregon State Univ., Corvains. Dept. of Civil Engineering.
S. A. Smith, and D. A. Bella.
Journal Water Pollution Control Federation, Vol
45, No 1, p 119-133, January 1973. 14 fig, 2 tab, 21
ref. OWRR A-003-ORE (7).

Descriptors: "Dissolved oxygen, "Water temperature, "Thermal stratification, Hypolimnion, Mixolimnion, Water properties, Water quality, Data collections, Water sampling, Epilimnion, Chemical analysis, Water analysis, "Oregon, Lakes, Hydrogen ion concentration, Alkalinity, Acidity, Suspended solids, Turbidity, Ammonia, Nitrates, Nitrites, Nitrogen, Phosphorus, Turnovers. Identifiers: "Diel variations," Triangle Lake (Ore), Metalimnion, Chlorophyll a, BOD5, Kjeldahl nitrogen, Orthophosphates.

Temporal and spatial variations of temperature and dissolved oxygen were measured in Triangle Lake in Oregon. The lake was relatively uniform in the horizontal direction and significantly stratified vertically. Diel dissolved oxygen variations were less than 0.5 mg/l in surface regions. Diel temperature variations resulted in a nocturnal density overturning extending to about 9 ft (3 m) in depth. Depth of summer diel overturning defined the lower boundary of the epilimnion and upper boundary of metalimnic dissolved oxygen maximum. Complete overturn did not occur during the mild winter of 1969-70, and low hypolimnetic dissolved oxygen values occurred the following summer. During summer months, desirable game fish habitats in the lake are restricted by temperature and oxygen conditions. (Holoman-Battelle)

OSMOTIC REVERSAL OF TEMPERATURE SENSITIVITY IN ESCHERICHIA COLI, Ottawa Univ. (Ontario). Dept. of Biology. For primary bibliographic entry see Field 05C.

RADIATION-RESISTANT MUTANTS OF SAL-MONELLA TYPHIMURIUM LT2: DEVELOP-MENT AND CHARACTERIZATION, Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science. R. Davies, and A. J. Sinskey. Journal of Bacteriology, Vol 113, No 1, p 133-144, January 1973. 5 fig, 7 tab, 46 ref.

Descriptors: Resistance, "Radiation, "Pollutant identification, Gamma rays, Cultures, Antibiotics (Pesticides), Genetics, Ultraviolet radiation, Proteins, Enzymes, Chemical analysis, Aerobic bacteria, Enteric bacteria, Coliforms, Pathogenic

bacteria.

Identifiers: "Biochemical characteristics, "Mutants, Bacterial physiology, "Salmonella typhimurium LTZ, Characterization, Salmonella typhimurium, Biochemical tests, Serological methods,
Phage typing, Sensitivity, Survival, Culture
media, RNA, DNA polymerase.

media, RNA, DNA polymerase.

A series of repeated exposures to gamma irradiation with intervening outgrowth of survivors was used to develop radioresistant cultures of Salmonella typhimurium LT2. Stepwise increases in resistance to both ionizing and ultraviolet irradiation were obtained independently of the presence or absence of integrated P22 prophage. Single clonal isolates, representing parent and radioresistant populations, retained the general characteristics of the LT2 parent, including serological properties, phage typing, antibiotic sensitivities, mouse virulence, and most biochemical test reactions. Resistant cells were generally larger and contained 1.8 to 2.1 times more ribonucleic acid and protein than parent cells, but deoxyribonucleic acid (DNA) contents were similar. Heterogeneity in the populations with respect to release of H2S, utilization of carbon sources, and growth on minimal medium is considered to be ancillary, rather than causally related, to increased radioresistance. The resistant isolates displayed an increased ability to reactivate gamma-irradiated P22 phage. DNA polymerase I and polymucleotide-joining enzyme activities were elevated in extracts of radioresistant cells relative to parent cells. It is suggested that the observed increases in radioresistance. The resistance result from a selection of mutations leading to an increased capacity to repair DNA. (Holoman-Battelle)

MICROBIAL DECOMPOSITION OF PEN-TACHLOROPHENOL, Purdue Univ., Lafayette, Ind. School of Civil En-

gineering. E. J. Kirsch, and J. E. Etzel.

Journal Water Pollution Control Federation, Vol 45, No 2, p 359-363, February 1973. 4 tab, 9 ref.

Descriptors: *Microbial degradation, *Wood preservatives (Pesticides), *Cultures, Microorganisms, Radioactivity techniques, Bioassay, Radioactivitys; Biodegradation, Carbon dioxide, Carbon radioisotopes. Identifiers: *Pentachlorophenol, *Fate of pollutants, Sodium pentachl orophenate, Bacterial populations, Substrate utilization, Degradation products, Heterotrophy, Acclimatization, Biocides, Chemical recovery, C-14, Culture media, Scintillation counting.

A soil sample was obtained from the grounds of a wood products manufacturer in Terre Haute, Indians, who used pentachlorophenol (PCP) and added to nutrient broth in order to obtain definitive evidence of PCP biodegradation in heterogeneous cultures of microorganisms. The biodegradation of sodium pentachlorophenate was

observed in both proliferating and nonproliferating mixed bacterial populations that had previously received lengthy acclimation to the biocide. Definite proof of dissimilation was obtained by measuring the release of C-1402 from radioactive sodium pentachlorophenate. The maximum yield of CO2 in a 24-hr exposure period was 68 percent in nonproliferating cultures. The rate and extent of decomposition in proliferating cultures was significant but less than found in nonproliferating cultures. Spontaneous, nonbiological decomposition of sodium pentachlorophenate was observed but did not exceed 0.1 percent in a 48-hr reaction period. (Holoman-Battelle)

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5C. Effects of Pollution

THE INFLUENCE OF BENTHIC BARK DEPOSITS ON AQUATIC COMMUNITY AND THE QUALITY OF NATURAL WATERS, Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 04C. W73-10411

MERCURY POLLUTION AND LAKE ERIE FISHES, Michigan State Univ., East Lansing. For primary bibliographic entry see Field 05A. W73-10444

ENHANCEMENT OF NET PRIMARY PRODUC-TIVITY BY HERBIVORE GRAZING IN AQUATIC LABORATORY MICROCOSMS, State Univ. of New York, Binghamton. Dept. of State Univ. of New Biological Sciences. D. C. Cooper. Limnology and Oceanography, Vol 18, No 1, p 31-37, January 1973. 4 fig, 1 tab, 22 ref.

Descriptors: *Bioassay, *Cycling nutrients, *Fish, *Grazing, *Primary productivity, Biomass, Dominant organisms, Chlorophyta, Cyanophyta, Anabaena, Rotifers, Crustaceans, Zooplankton, Phytoplankton, Succession, Standing crops. Identifiers: Notropia spilopterus, Spirogyra, Testudinella, Gastropus, Ceriodaphnia reticulata, Cyclops, Epischura, Aphanizomenon.

The role of herbivore grazing intensity as a factor The role of herbivore grazing intensity as a factor affecting net primary productivity was investigated by introducing varying biomasses of a starved herbivore (Notropis spilopterus) into replicate autotrophic microcosms. The microcosms consisted of 15 aquaria containing 15 of sediment from a eutrophic pond. After 20 days, the enhancement of net primary productivity in the experimental microcosms was directly related to herbivore biomass up to a certain density and inversely related above this. The relationship approximates the first derivative of a sigmoid approximates the first derivative of a sigm population growth model. Enhancement of pris oduction under these experimental conditions are to be due to reductions of standing crop ry producti

appears to be due to reductions of standing crop and increased turnover rates of producer popula-tions. The results suggest that these responses were independent of increased nutrient regenera-tion rates brought about by grazing. (Little-Battelle) W73-10460

PERIODICITY PHYTOPLANKTON ASSEMBLAGE OF A HIGH MOUNTAIN LAKE, Innsbruck Univ. (Austria). Inst. of Zoology.

Limnology and Oceanography, Vol. 18, No 1, p 15-30, January 1973. 9 fig, 4 tab, 34 ref.

Descriptors: *Diurnal distribution, *Phytoplankton, *Photosynthesis, *Light intensity, *Migration

patterns, *Primary productivity, Lakes, Solar radiation, Algae, Anabaena, Diatoms, Sampling, Diel migration.

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Identifiers: Sample preservation, Periodicity, Mountain lakes, Gymnodinium uberrimum, Desmids, Mallomonas, Synedra nana, Tetraedro, Cryptomonas ovata, Dinobryon sertularia, Synura petersenii, Gymnodinium cf. lacustre, Peridinium aciculiferum, Certain hirundinella, Cryptomonas marsonii, Glenodinium.

marsonii, Glenodinium.

Diurnal changes in phytoplankton stratification and photosynthesis of high mountain lakes (Vorderer Finstertaler See) were studied at all seasons. The dominant flagellates usually ascend in the evening and at night and migrate downward with increasing light intensities. Maximum migratory speeds are higher than 1 m/hr and almost independent of cell size. The vertical stratification pattern of flagellates is the result of varying upward and downward migrations, but the vertical stratifications of nonmotile species depend on the turbulence of the water. Over the day the mean photosynthesis of the entire water column varies in about the same proportions as the input of light energy. At a given depth algae seem to be adapted to the daily mean value of light intensity. Near the lake surface, around noon (1000-1400 hours), photosynthesis is considerably reduced due to downward migration, light saturation, and light inhibition—all caused by high light intensities—but at greater depths the utilization of light energy frequently is increased. During low light periods (early morning, evening) suboptimal light intensities in deeper layers of the lake cannot be utilized as effectively. By phototactic verticle migrations, the diurnal shifts of light energy utilization can be partly compensated. (Little-Bettelle)

MARINA DEL REY: A STUDY OF ENVIRON-MENTAL VARIABLES IN A SEMI-ENCLOSED COASTAL WATER, University of Southern California, Los Angeles. Environmental Engineering Program. For primary bibliographic entry see Field 05B. W73-10465

AN ANALYSIS OF FACTORS GOVERNING PRODUCTIVITY IN LAKES AND RESER-

VOIRS, Dalhousie Univ., Halifax (Nova Scotia). Dept. of

Dathouse Charles Biology.
M. Brylinsky, and K. H. Mann.
Limnology and Oceanography, Vol. 18, No. 1, p 114, January 1973. 11 fig, 5 tab, 28 ref.

Descriptors: "Primary productivity, "Secondary productivity, "Limiting factors, "Nutrients, "Lake morphology, "Solar radiation, "Statistical methods, Hydrogen ion concentration, Conductivity, Lakes, Reservoirs, Water analysis, Biomass, Chlorophyll, Energy transfer, Phytoplankton, Zooplankton, Benthos, Depth, Water temperature, Nitrates, Phosphates, Alkalinity, Calcium, Dissolved solids, Phosphorus, Nitmeen, Reseression, analysis, Photosynthesis,

Nitrogen, Regression analysis, Photosynthesis, Data collections, Water quality. Identifiers: Data interpretation, *Chlorophyll a.

Data collected as part of the International Biological Program from 43 lakes and 12 reservoirs, distributed from the tropics to the arctic, were subjected to statistical analysis to establish which factors are important in controlling production and how they are related. In the whole body of data, variables related to solar energy input have a greater influence on production than variables related to nutrient concentration; in lakes within a narrow range of latitude, nutrient-related variables assume greater importance. Morphological factors have litte influence on productivity per unit area in either case. Chlorophyll a concentration is a good indicator of nutrient conditions and when combined with an energy-related variable constitutes a

good estimator of primary production. (Little-Bat-W73-10475

UPTAKE AND BIOTRANSFORMATION OF PHENYLMERCURIC ACETATE BY AQUATIC ORGANISMS, Oregon State Univ., Corvallis. Dept. of Agricul-tural Chemistry. For primary bibliographic entry see Field 05B. W73-10477

KINETIC STUDY OF PHOSPHATE REACTION WITH ALUMINUM OXIDE AND KALONITE, Harvard Univ., Cambridge, Mass. Div. of En-gineering and Applied Physics. For primary bibliographic entry see Field 05B. W73-10479

SEASONAL FLUCTUATIONS OF IONIC COPPER IN KNIGHTS POND, MASSACHUSETTS, Massachusetts Univ., Amherst. Dept. of Zoology. For primary bibliographic entry see Field 05B. W73-10487

THE VALIDITY OF THE APPLICATION OF SIMPLE KINETIC ANALYSIS TO HETEROGENEOUS MICROBIAL POPULAampton Univ. (England). Dept. of Oceanog-

raphy. P. J. LeB. Williams.

Limnology and Oceanography, Vol 18, No 1, p 159-165, January 1973. 1 fig, 1 tab, 13 ref.

Descriptors: "Mathematical models, "Aquatic bacteria, "Growth rates, "Metabolism, "Nutrients, Population, Absorption. Identifiers: Data interpretation, Substrate utiliza-

tion. Species diversity

It is shown by use of a mathematical model that heterogeneous populations do not adhere to the Michaelis and Menten equation; at low substrate concentration, observed rates are higher than predicted ones. The discrepancy between observed and predicted values increases as the population becomes more diverse. If kinetic analysis based on the Michaelis and Menten equation is used to determine the rate of turnover of substrates in natural waters, the rate may be underestimated unless measurements are made at very low added substrate concentration. (Little-Battelle) W73-10489

METHODS OF ESTIMATING THE HALF-LIFE OF BIOLOGICAL ACTIVITY OF TOXIC CHEMICALS IN WATER, Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab. L. L. Marking. Investigations in Fish Control Report No 46, July

1972. 9 p. 2 fig. 3 tab. 5 ref.

Descriptors: *Antimycin A, *Pescicides, *Bioassay, *Water pollution effects, *Pesticide toxicity, *Methodology, Fish control agents, Rainbow trout, Channel catfish, Pesticide kinetics, Freshwater fish, Sunfishes, Hydrogen ion concentration, Hardness (Water), Mortality.

Identifiers: Biological activity, Half-life, Green sunfish, Goldfish, Median tolerance limit, Carassius auratus, Ictalurus punctatus, Lepomis cyanellus, Salmo gairdneri.

In the absence of analytical methods, the half-life of biological activity of a chemical (the time required to decrease its toxic activity by one-half) can be extimated by bioassays. The methods presented require the determination of LC50 values (concentration producing 50 percent mor-

tality) for organisms in aged solutions containing unknown residual concentrations. The half-life of biological activity is determined by plotting (1) the percent concentrations remaining in aged solutions or (2) the deactivation indices against aging time on cyclic semilogarithmic graph paper. By the first method, a 5-day half-life for antimycin, a fish toxicant, was determined using resistant channel catfish (Ictalurus punctatus) and goldfish (Carassius auratus) and for sensitive green sunfish (Lepomis caratus) and for sensitive green sunfish (Lepomis only rainbow trout, daso estimated a 5-day half-life for antimycin in soft water at pH 7-5. These methods could be used also to determine the half-life of antimycin at different pH's, temperatures, and light intensities, the factors thought to influence the toxicant's efficacy. The methods are not limited to fish and fish toxicants. (Holoman-Battelle) W73-10495 W73-10495

RESIDUES OF MS-222 IN NORTHERN PIKE, MUSKELLUNGE, AND WALLEYE, Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab. For primary bibliographic entry see Field 05A. W73-10496

ULTRASTRUCTURE OF STAPHYLOCOCCUS EPIDERMIDIS AFTER FREEZE-ETCHING AND THIN SECTIONING, McGill Univ., Montreal (Quebec). Dept. of Microbiology. For primary bibliographic entry see Field 05A. W73-10500

STUDIES OF THE CELL ENVELOPE OF VIBRIO PARAHAEMOLYTICUS, Georgetown Univ., Washington, D.C. Dept. of Biology. For primary W73-10501 ary bibliographic entry see Field 05A.

DYNAMICS OF A SALT OF (2,4-DICHLOROPHENOXY) ACETIC ACID IN FISH, WATER, AND HYDROSOL. Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab. D. P. Schultz. Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 186-192, March/April 1973. 8 tab, 9 ref.

Descriptors: "Pesticide toxicity, Water analysis, "Bioassay, "Hydrogen ion concentration, "Radioactivity techniques, Water temperature, Freshwater fish, Toxicity, 2 4-D, Pesticide residues, Absorption, Gas chromatography, Animal metabolism, Fish eggs. Identifiers: "DMA-2 4-D, Tissue, Bioaccumulation, Sample preparation, "Gas liquid chromatography, Channel catfish, Lepomis macrochirus, Largemouth bass, Fathead minnow, Blood, Brain, Excretion, Scintillation counting, Gills, Bile, Liver, Kidney, Muscle, Fat, Pyloric caeca, Testes, Hydrosol, Biological magnification.

The uptake, distribution, and dissipation of C-14-labeled dimethylamine salt of (2,4-dichlorophenoxy)acetic acid (DMA-2,4-D) from water by three species of fish was studied concurrently with the dissipation of DMA-2,4-D from water and hydrosol. Fish were exposed to 0.5, 1.0, or 2.0 mg/l. concentrations of herbicide for up to 84 days. Radioactive residues of 2,4-D were determined by addingstric recordures in sight or water 84 days. Radioactive residues of 2,4-D were determined by radiometric procedures in eight or more tissues and organs. Residues of 2,4-D were determined in muscle and whole-body extracts by gas chromatography. Radioactive residues were found in all fish tissues and organs analyzed, but actual 2,4-D content was negligible in muscle, indicating that most of the C-14-residue was a metabolite (s) of 2,4-D. Residues of 2,4-D declined in water to

Group 5C—Effects of Pollution

less than 0.1 mg/l. after 35 days and in hydrosol to less than 0.1 mg/kg after 14 days. (Little-Battelle) W73-10507

BIOLOGICAL NITROGEN FIXATION IN THE

GREAT LAKES, Wisconsin Univ., Madison, Dept. of Biochemis-

uy. T. H. Mague, and R. H. Burris. BioScience, Vol 23, No 4, p 236-239, April 1973. 3 fig, 3 tab, 18 ref.

Descriptors: *Nitrogen fixation, *Great Lakes, *Phytoplankton, Water sampling, Oligotrophy, *Eutrophication, Nitrogen cycle, Cycling mutrients, Cyanophyta, Lake Brie, Lake Huron, Lake Superior, Lake Michigan, Methodology, Diatoms, Chrysophyta, Anabaena, Dinoflagellates, Pyrrophyta, Chlorophyta. Identifiers: Green Bay, *Acetylene reduction, Flame ionization gas chromatography, Sample preparation, Asterionella formosa, Fragilaria, Tabellaria, Oscillatoria, Aphanizomenon floaquae, Microcystis aeruginosa, Lyngbya, Pediastrum, Ceratium hirundinella, Van Dorn bottles, Ethylene.

The acetylene reduction technique was used for assessing potential N2-fixation in lake water samassessing potential N2-fixation in lake water sam-ples. Water samples from Green Bay and Lakes Erie, Superior, Huron and Michigan were passed through a 64-micron silk plankton netting to con-centrate the phytoplankton prior to testing. One-ml samples of the concentrate were transferred to glass serum bottles to which acetylene was added directly without other modification of the at-mosphere. The bottles were incubated for approxi-mately 30 min: acetylene reduction was terminated directly without other modification of the atmosphere. The bottles were incubated for approximately 30 min; acetylene reduction was terminated by the addition of 5 N H2SO4 and the serum stoppers were sealed against possible leakage. Four replicate bottles were prepared from each sampling site, and one was immediately inactivated with acid to serve as a control. The quantity of ethylene was determined by flame ionization after gas chromatographic separation from acetylene on a 1.2 m x 2 mm column of Poropak N run at 75 degrees C. Acetylene reduction by the phytoplankton in Lake Superior, the western end of Lake Huron, and eastern Lake Michigan was barely detectable in September of 1970, but in southern Green Bay of Lake Michigan and the shallow basin of Lake Erie it was comparable in rate to that in eutrophic Wisconsin lakes. Acetylene reduction activity in Green Bay was low in the mouth of the main tributary, increased to a maximum 5-15 km northeast into the bay, and then decreased farther northeast. Vigorous acetylene decreased farther northeast. Vigorous acetylene reduction was always associated with an abundance of heterocystous blue-green algae. (Holoman-Battelle)

EFFECTS OF IRON ON ACTIVATED SLUDGE

TREATMENT, Marquette Univ., Milwaukee, Wis. For primary bibliographic entry see Field 05D. W73-10512

PRODUCTION OF THE GIANT KELP, MACRO-CYSTIS, ESTIMATED BY IN SITU INCOR-PORATION OF C-14 IN POLYENTHYLENE BAGS, Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station

For primary bibliographic entry see Field 05B. W73-10516

A FIELD FIXATION TECHNIQUE FOR DIS-SOLVED PHOSPHATE IN LAKE WATER, Minnesota Univ., Minneapolis. Limnological Research Center.

J. Shapiro. Limnology and Oceanography, Vol 18, No 1, p 143-145, January 1973. 4 tab, 2 ref.

Descriptors: *On-site investigations, *Solvent extractions, *Phosphates, Spectrophotometry, Pollutant identification, Chemical analysis, Lakes, Chelation, Chemical reactions, Color reactions. Identifiers: *Sample preservation, *Orthophosphates, Accuracy, Natural waters, *Sample storage, Sample preparation, Isobutanol, Phosphomolybdic acid.

Natural water samples containing dissolved orthophosphate may be fixed in the field and analyzed for orthophosphate in the laboratory as much as 2 weeks later. This fixation method inmuch as 2 weeks later. This fixation method involves adding reagents to the water sample and extracting the phosphomolybdic acid formed into isobutanol within 30 sec. In the laboratory the phosphomolybdate in isobutanol was washed with dilute HCl, made to volume, and stannous chloride was added to reduce the compound to its blue form. The color was read in a spectrophotometer and compared with standards. Storage of the samples for 7 days results in values that are at most 15 percent different from the initial values; after 2 weeks the greatest deviation was less than 20 percent. With this fixation method, it is not necessary to keep the extract in the dark. No special preservations are supported to the contract of the compound of the contract of the contra cent. With this fixation method, it is not necessary to keep the extract in the dark. No special preservation methods are necessary either for the water samples or the extracts, and instead of carrying water samples back from the field one need bring back only small vials of extract. (Holoman-Battelle) W73-10519

THE UPTAKE, STORAGE, AND RELEASE OF DIELDRIN AND SOME EFFECTS OF ITS RELEASE IN THE FISH, CICHLASOMA BIMACULATUM (LINNAEUS).

Michigan Univ., Ann Arbor. For primary bibliographic entry see Field 05B. W73-10536

A STUDY OF THE INFLUENCE OF CALCIUM ON THE EFFECTS OF DDT ON FISHES,

Mississippi Univ., University. L. R. Keffler.

Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-1275. Ph D Dissertation, 1972. 131 p.

Descriptors: *Calcium, *DDT, Water pollution effects, *Bioassay, *Poisons, *Pesticide toxicity, Freshwater fish, Chlorinated hydrocarbon pesticides, Laboratory tests, Insecticides.

Identifiers: *Goldfish, *Golden shiner, Carassius auratus, Notemigonus crysole

Investigations were undertaken dealing with a likelihood of a relationship between calcium deficiency and DDT poisoning. Goldfish, Carassius auratus, and golden shiners, Notemigonus crysoleucas, were tested using sixteen different combinations of calcium and DDT concentrations. Because of the possibility of influence by the accompanying anion, three different salts were used as sources of the calcium ion. A series of different Because of the possibility of influence by the accompanying anion, three different salts were used as sources of the calcium ion. A series of different experimental tests indicated good probability of the suspected relationship between calcium and DDT. Fishes poisoned with DDT in the laboratory were observed to give evidence of all the symptoms of calcium deficiency. Increasing the concentration of calcium ions in the water from 0 to 200 ppm seemed to alleviate the DDT poisoning symptoms of fishes and decrease the death rate, when the DDT concentration did not exceed 20 ppb. Goldfish were more responsive to treatment than the DDT concentration did not exceed 20 ppt. Goldfish were more responsive to treatment than were golden shiners. Of the calcium salts used calcium carbonate or calcium gluconate. Two possible conclusions to be drawn are that DDT is not simply a neurotoxin, and that the calcium differences between hard and soft water may be sufficient to give a survival advantage to fished in the hard water regions of the country. (Holoman-Battelle) W73-10537

THE CARBON CYCLE IN THE EPILIMNION OF TWO MICHIGAN LAKES, Michigan State Univ., East Lansing. M. C. Miller.
Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-3446. Ph D Dissertation, 1972. 233 p.

Descriptors: *Biological communities, *Cycling nutrients, *Essential nutrients, *Carbon cycle, *Epilimnion, Water pollution sources, Metabolism, Benthos, Model studies, Lakes, Primary productivity, Nutrient requirements, Standing crops, Sedimentation rates, Michigan, Degradation (Decomposition), Limiting factors, Absorption

tion. Identifiers: *Dissolved organic carbon, *Particu-late organic carbon, Substrate utilization, Heterotrophic nutrition, Oxygen depletion, Glu-cose, Acetates, Glycolates.

cose, Acetates, Glycolates.

The planktonic communities of two contrasting lakes were examined to quantify budgets and dynamics of dissolved and particulate organic carbon. Rates of primary production, extracellular secretion, particulate carbon sedimentation, input of humic material, heterotrophic uptake of glucose, acetate and glycolate, and oxygen depletion were determined in relation to simultaneous measurements of standing crops of algal carbon, total dissolved, and particulate organic carbon and humic organic carbon. Benthic metabolism affected the planktonic heterotrophis more in the shallower lake. In general, the heterotrophic uptake of small organic molecules varied directly with planktonic algal production and secretion. The size of the particulate organic carbon pool was proportional to the rates of primary production. The size of the dissolved organic carbon pool was apparently related inversely to the amounts of limiting nutrients. In the deeper of the two lakes the inputs of dissolved organic carbon to the surface waters ranked by importance were: autolysis and algal cell rupture, runoff in rainwater, secretion by and decomposition of aquatic plants, phytoplankton secretion, and particulate organic carbon decomposition in the water column. Rates of transfer and organic carbon pools are discussed and a model integrating these results is presented. (Holoman-Battelle)

THE EFFECT OF CALCIUM ON GROWTH AND MORPHOGENESIS OF CHLORELLA, GOLENKINIA, AND SCENEDESMUS, Washington State Univ., Pullman. H. Rahimian.

Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-73. Ph D Dissertation, 1972. 89 p.

Descriptors: Water pollution effects, *Calcium, *Plant morphology, *Aquatic algae, *Plant physiology, Plant growth, Strontium, Aquatic plants, Alkaline earth metals, Cultures, Enzymes, Bioassay, Chelation, Limiting factors.
Identifiers: Ethyleneglycol bisaminoethylether tetraacetic acid, Barium, *Chlorella pyrenoidosa, *Scenedesmus obliquus, *Golenkinia minutissima, Culturing techniques, Enzyme activation, Uridine diphosphoglucose pyrophosphorylase, Uridine diphosphoglucose fructose transglucosylase.

Morphogenetic effects of calcium on Chlorella pyrenoidosa, Scenedesmus obliquus, and Golen-kinia minutissima strains 929 and 930 were stukinia minutissima strains 929 and 930 were studied, as were the effects of strontium, barium, and ethyleneglycol bisaminoethylether tetraacetic acid (EGTA) on Scenedesmus. Inoculated cells were starved in a calcium-free medium for one week before the time of inoculation. Organisms were grown under controlled conditions at a temperature of about 20 C and illuminated with an intensity of 350 ft-c from cool-white fluorescent lamps regulated to provide 16 hours of light and 8 hours of darkness. Cultures were aerated with a mixture of 3 percent CO2 in air. Growth was measured in

terms of increase in the cell population and in-crease in the amount of fresh and dry matter. The results were as follows: (1) Calcium was shown to crease in the amount of fresh and dry matter. The results were as follows: (1) Calcium was shown to be necessary for production of the maximum number of cells in each species studied. (2) In the presence of Ca the cultures yielded a greater weight production and greater dry weight per gram of fresh weight than in the absence of Ca. (3) In the presence of Ca the starch content of cells was greater. (4) The K/Na ratio in the cells was greater in the presence of Ca. (5) The number of cells produced was significantly decreased when Sr or Ba was substituted. (6) Calcium played a role in cell morphology. (7) Calcium was shown to be necessary for colony formation in Scenedesmus. (8) Cell size was found to be inversely proportional to the number of cell production. (9) Seta formation in Golenkinia was shown to require Ca. (10) In the presence of higher than 0.6 mM of EGTA, a specific chelating agent for Ca, the algal cells died. (11) It is hypothesized that Ca is required for activating enzymes involved in wall formation and cell division as well as for maintaining membrane integrity. This has already been established for uridine diphosphoglucose pyrophosphorylase and uridine diphosphoglucose fructose transglycosylase which function in wall formation. (Holoman-Battelle)

POPULATION DYNAMICS AND THE EFFECT FOPULATION DYNAMICS AND THE EFFECT OP INORGANIC IONS ON CERTAIN MICROCRUSTACEA, Cincinnati Univ., Ohio. C. B. Carpenter. Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor Mich., 48106, Order No. 73-3824. Ph D Dissertation, 1972. 108 p.

Descriptors: *Crustaceans, *Zooplankton, *Bioas-say, *Sodium compounds, *Potassium com-pounds, Environmental effects, *Cations, Inver-tebrates, Carbonates, Ponds, Waterfleas, Copepods, Laboratory tests, Freshwater, Water sampling, Water temperature, Dissolved oxygen, Carbon dioxide, Light intensity, Air temperature, Allalinity, Hydrogen ion concentration, Sodium chloride. chloride

chloride.

Identifiers: Population density, Data interpretation, Median tolerance limit, Chemical indicators,
Methyl orange, Phenophthalein, Nauplii, Daphnia
pulex, Daphnia magna, Ceriodaphnia reticulata,
Bosmina longirostris, Diaptomus spp, Daphnia
spp, Potassium chloride, Sodium bicarbonate,
Potassium bicarbonate, Sodium hydroxide, Potassium hydroxide, Sodium carbonate, Potassium carbonate, Factorial analysis.

carbonate, Factorial analysis.

Some of the primary and most important microcrustacean species were used in a field study of freshwater ponds with reference to seasonal changes in population density and effects of environmental conditions. Samples taken from two fresh-water ponds were analyzed for numbers of microcrustacea per liter of pond water, pH, water temperature, air temperature, dissolved oxygen, total alkalinity (methyl orange), carbonate alkalinity (phenolphtalein), bottom dissolved oxygen, free carbon dioxide and light intensity at the surface of the pond. The representative microcrustacea were Bosmina longirostris, Ceriodaphnia reticulata, Daphnia spp., Diaptomus spp., and copepoda nauplitus larvae of unidentified species. Because of high negative correlations with the alakalinity parameter laboratory studies were executed to determine the effects of the component ions on the organisms in a controlled testing regime. LD-50 values were determined for nine clones (6 Daphnia magna, 2 Daphnia pulex, and 1 Ceriodaphnia reticulata) when they were exposed to NaCl, KCl, NaHCO3, KHCO3, NaOH, KOH, NaZCO3 and K2CO3, Pactorial analysis of the data was magna, 2 Daphnis pulex, and 1 Ceriodaphnia reticulata) when they were exposed to NaCl, KCl, NaHCO3, KHCO3, NaOH, KOH, Na2CO3 and K2CO3. Pactorial analysis of the data was used to determine the extent of each main cation and anion effect and any interaction effects. On the basis of the factorial analysis, the negative correlations between the organisms and the alkalinity

parameters are valid with respect to information from both lab tests and field data. (Holoman-Battelle) W73-10542

THE RELATIONSHIP BETWEEN IONS AND CILLARY ACTIVITY IN THE GILL OF MYTI-LUS EDULIS, Fordham University, Broax, N.Y.

Descriptors: "Cations, "Anions, "Inhibition, Water pollution effects, "Animal physiology, Halides, Heavy metals, Alkaline earth metals, Alkaline metals, Clams, Sodium, Potassium, Calcium, Magnesium, Chlorides, Manganese, Inhibitors, Mollusks, Invertebrates.
Identifiers: "Mytilus edulis, "Ciliary activity, Excitation, Tetrodotoxin, Lithium, Barium, 5-Hydroxytryptamine, Calcium electrode, Ion selective electrodes. Gills, Caffeine, Macroinvertebrates, Cal-145, Calcium radioisotopes, Scintillation counting, Choline.

tebrates, Ca-145, Calcium radioisotopes, Scintillation counting, Choline.

Previous authors have reported that ions stiumlate or inhibit ciliary activity in Mytilus edulis. This investigation attempts to clarify the relationship between the major ions in artificial sea water (ASW) of normal balance to the beating of lateral cilia and other types of cilia in the excised gill of Mytilus edulis. ASW was used to perfuse a ganglion-nerve gill preparation. The rate of ciliary beating was determined by timing the metachronal waves with a stroboscope. The effect of Na, K, Ca, Mg and C1, on the basal beat frequency and on the cilioexcitatory effect of S-hydroxytrptamine (5-HT), KC1, and caffeine was determined. Li, Ba, Mn were studied for the same effects. By replacing the ions in ASW of normal balance with substitutes, such as other ions, choline, gluconate salts, or sorbitol, it was possible to detect the influence of the major ions. Tetrodotoxin (TTX) 0,000016 M does not inhibit ciliary activity of the gill in ASW. In a 1:1 choline/Na ASW, TTX 3 microM (1 microgram/ml) inhibit slateral cilia and blocks the cilioexcitatory effect of KC1. Li 42 mM is cilioinhibitory and also blocks excitation by 5-HT. Nerve stimulation with electrical current is partially blocked by Li. The addition of 5-HT to gill is a ASW causes a rapid efflux of Ca. The Ca efflux and influx in gill tissue was measured with a ca selective electrode and also with Ca-45 in a scintillation counter. Caffeine was cilioexcitatory in this investigation, and was tested by the same methods described for 5-HT. When Mn was substituted for Ca in the presence of TTX in 1:1-choline/Na ASW, cilioexcitation by 5-HT and cifeine were not blocked. When Ba or Mn is substituted for Ca in the presence of TTX in 1:1-choline/Na ASW, cilioexcitation by 5-HT and salso studied. 5-HT, a known cilioexcitatory agent and metabolic activator in Mytilus gill, has now been shown to cause a change in the membrane permeability of gill tissue to Ca. 5-HT causes a rapid efflux followed b

FRESHWATER ALGAE FROM THE ITASCA STATE PARK MINNESOTA, IV. CYANOPHTA, RHODOPHYTA, CHLOROMONADOPHYCEAE, AND CRYPTOPHYCEAE, Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology. For primary bibliographic entry see Field 05A. W73-10544

DIATOMS IN ALKALINE, SALINE LAKES: ECOLOGY AND GEOCHEMICAL IMPLICA-

TIONS, Duke Univ., Durham, N.C. Dept. of Zoology. R. E. Hecky, and P. Kilham. Limnology and Oceanography, Vol 18, No 1, p 53-71, January 1973. 7 fig, 4 tab, 52 ref.

Descriptors: *Diatoms, *Saline lakes, *Alkalinity, *Dominant organisms, *Lake sediments, Chrysophyta, Aquatic algae, Geochemistry, Limnology, Water chemistry, Water sampling, Bottom sampling, Biological communities, Plant populations, Shallow water, Meromixis, On-site data collections, Hydrogen ion concentration, Calcium, Chlorides, Magnesium, Phosphates, Silica, Conductivity, Sodium, Potassium, Sulfates, Fluorides, Water analysis, Chemical analysis, Bicarbonates, Carbonates, Benthic flora, Ecology, Systematics, Classification.

Classification.
Identifiers: *East Africa, Light microscopy, Sample preservation, Sample preparation, Silicon, Atomic absorption spectrophotometry, Ekman dredge, Cyclotella mengshiniana, Coscinodiscus rudolfi, Navicula elkab, Nitzschia frustulum, Nitzschia sigma, Anomoeoneis sphaerophora, Rhopalodia gibberula, Nitzschia hungarica, Pragilaria pianata, Eunotia, Stauroneis, Achnanthes exigua, Achnanthes lanceolata, Amphora coffeaeformis, Amphora ovalis.

Amphora coffeaeformis, Amphora ovalis.

Six diatoms achieved dominance in 26 alkaline, saline lakes in East Africa. There is a pronounced tendency for these species to replace each other as alkalinity increases. Cyclotella meneghiniana is usually dominant in less concentrated lakes and Nitzschia frustulum is favored as the alkalinity exceeds 80 meq/liter. Coscinodiscus rudolfi and Naviculas elkab are occasionally dominant intermediate alkalinities. Navicula elkab is usually subdominant when N. frustulum is dominant. Most of these species when dominant are considered functionally planktonic in these waters. The presence of the cyanophyte Oscillatoria (Arthrospira) platensis in bloom seems to be a prerequisite for N. elkab and N. frustulum to enter the plankton. There is some evidence that the anionic composition of these lakes may be selective for some of the benthonic species. Geochemical data indicate that the production and preservation of diatom frustules appear to control silica concentrations in the waters. Relatively poor correlations were observed between sodium and silica and between pH and silica. These data have important implications for theoretical models of geochemical evolution in closed basins. Little or no dissolution of fossil diatom frustules was observed in the sediments of these highly alkaline, high pH waters. (Holoman-Battelle)
W73-10545 W73-10545

STUDY OF THE CONTAMINATION OF ARENICOLA MARINA L. BY COBALT-60, (ETUDE DE LA CONTAMINATION D'ARENICOLA MARINA L. (ANNELIDE POLYCHETE) PAR LM COBALT-60), Commissariat a l'Energie Atomique, Fontenayaux-Roses (France). Service de Recherches Toxicologiques et Ecologiques.
C. Triquet.
Comptes Rendus De L'Academie des Sciences

C. Inquet. Comptes Rendus De L'Academie des Sciences, Vol 276, Series D, No 4, p 645-648, January 22, 1973. 3 fig, 12 ref.

Descriptors: "Cobalt, Water pollution effects, "Radioactivity, "Annelids, "Worms, "Vectors (Biological), Seawater, Sediments, Organic matter, Animal physiology, Digestion. Identifiers: "Polychaetes, "Arenicola marina, Contaminant of contaminant o Contaminant concentration

Populations of the marine polychaete Arenicola marina were contaminated with cobalt-60 from wastes of the nuclear power industry. Three vec-tors were suggested: water, substrate, sediments, and organic material in the sediments (Arenicola is a suspension feeder). Such organisms concentrate

Group 5C—Effects of Pollution

cobalt-60 to a high degree in their blood. The method of contamination was studied experimen-tally in water contaminated with chloride of cobalt-60. Results of the contaminant conentration studies indicated water passing over the sediments as the vector. The concentration of radioactivity at the digestive tube levels in the worms indicated that contaminants are concentrated in the organic material in sediments and then ingested. A marked increase in level of radioactivity was noted. (Ensign-PAI) W73-10551

HEAVY METALS IN ESTUARIES AND THE

COASTAL ZONE, Oregon State Univ., Corvallis. School of Oceanography.

For primary bibliographic entry see Field 05B. W73-10555

THE LIMNOLOGY OF STOCKBRIDGE BOWL, STOCKBRIDGE, MASSACHUSETTS, Massachusetts Univ., Amherst. Dept. of Zoology. S. D. Ludlam, K. S. Hutchison, and G. E.

Henderson

Available from the National Technical Information Service as PB-221 021, \$3.00 in paper copy,

\$0.95 in microfiche. Massachusetts Water Resources Research Center Completion Report FY-73-4, (1973). 63 p, 4 fig, 16 tab, 38 ref. OWRR A-044 MASS (1).

Descriptors: *Eutrophication, *Paleolimnology, *Calcium, *Silica, *Aquatic productivity, Dissolved oxygen, Sedimentation rates, Lake sediments, Water temperature, Phytoplankton, Algae, Diatoms, Aquatic plants, Lake morphology, *Massachusetts.

Identifiers: New England Lakes, Berkshire Lakes, *Stockbridge Bowl (Mass).

Stockbridge Bowl is a eutrophic hard-water lake. Mean annual gross primary productivity was ca. A.9 g C per square meter per day. Microcoleus lyngbyaceus dominated the phytoplankton through much of the year and formed a productive metalimnetic plate during summer stratification. Silica never became limiting to diatom growth, despite a spring diatom pulse. Silica, calcium and magnesium all showed inverse clinograde distributions during periods of stratification and values in the hypolimnion began to rise before anoxia. Fall in Ca-Mg hardness and delayed rise in Si values in the summer epilimnion were caused by precipita-tion of marl and uptake of Si in the littoral zone. sediments were laminated and the laminae were approximately annual. Analysis of diatom communities in the sediment revealed rapid increase in productivity over the past quarter century associated with development of the watershed. W73-10561

THE ECONOMIC EFFECTS OF PAW-TUCKAWAY STATE PARK: V. EFFECT OF PARK USE ON ENVIRONMENTAL QUALITY, New Hampshire Univ., Durham. Water Resources Research Center.

C. T. K. Ching, and G. E. Frick.

Available from the National Technical Informa-Available from the National Technical Information Service as PB-221 022, \$3.00 in paper copy, \$0.95 in microfiche. New Hampshire Water Resources Research Center, Durham, Research Report No 8, December 1972. 53 p. 10 fig. 18 tab, 11 ref. OWRR A-026-NH (1). 14-31-0001-3229.

Descriptors: *Environmental effects, *Water quality standards, *Parks, Recreational facilities, Coliforms, Water analysis, Property values, Water utilization, *New Hampshire, Sampling, Regression analysis.

Identifiers: *Pawtuckaway State Park (N.H.), *Nottingham, Analysis of variance.

The purpose was to determine the effect of Paw-tuckaway State Park on the quality of the im-The purpose was to determine the effect of Pawtuckaway State Park on the quality of the immediate environment. During the summer of 1971, an intensive study was made of (1) lake water quality as affected by park usage, and (2) the attitudes of private water-oriented landowners toward the park. First, physical measurements of water quality were made and twelve water quality indices were determined by a sampling process. Measurements indicated that the levels of eleven water quality indices were within acceptable bounds for recreational use. Coliform count, the twelfth indicator, occasionally exceeded State limits, but the mean value of the beach area was below the State limit. Neither climate, attendance, weekend use (as high as 8,000 people), nor time were significant determinants of the coliform level. Second, a survey of shoreline residents was conducted to determine their attitudes about the impact of the park on the environmental quality of the surrounding area. This survey indicated that the majority of the 90 landowners interviewed held favorable attitudes toward the park, including an opinion that the park improved their property values. Both the water quality analysis and the attitudinal survey indicated that the establishment of Pawtuckaway State Park has not had an adverse effect on the quality of the environment. W73-10562 effect on the quality of the environment. W73-10562

POLLUTION OF THE MARINE ENVIRON-MENT AND THE EFFECTS THEREFROM: THE CASE FOR STRICTER ENFORCEMENT,

CASE FOR STRUCTER ENFORCEMENT, York Univ., Downsview (Ontario). Faculty of En-vironmental Studies. L. M. Edelstein, and M. S. Wei. In: Oceans Ontario. Technical Sessions. April 22, 1972. James Allister Mac Innes Foundation, Toronto, Ontario, Canada, p 53-81, (1972). 18 ref.

Descriptors: *Canada, *Coasts, *Water pollution Descriptors: "Canada, "Coasts, "water polituton control, "Oil, Chemicals, Radioactive wastes, "Water pollution effects, Toxicity, Aquatic life, Food chain, Biological oxygen demand, Balance of nature, Oil spills, Cleaning, Burning, Chemi-cals, Dispersion, Skimming, "Legislation.

The difficulties faced by Canada, having the longest constline in the world are unique and she is forced to come to terms with the many pollution problems of her seas and coasts. The effects of crude oils, noxious chemicals, and radioactive crude oils, noxious chemicals, and radioactive wastes on the ocean environment are discussed, including toxicity to marine life, assimilation into the food chain, high BOD, and upset of the ecological balance. The immediate and long-term effects of oil spills are stressed; cleanup techniques such as burning, skimming, sinking, and chemical dispersal are described. Canada's position as a coastal state rather than a shipping state limits her effectiveness internationally. Canadian legislation concerning pollution control is discussed. (Ensign-PAI) PAI) W73-10581

AN ECOLOGICAL STUDY OF THREE FRESH WATER PONDS OF HYDERABAD-INDIA: II. THE ENVIRONMENT, Osmania Univ., Hyderabad (India). Hydrobiology

Lab

V. S. Rao.

Hydrobiologia. Vol 39, No 3, p 351-372, 1972. Identifiers: *Bacteria, Ecological studies, Environment, *India (Hyderabad), *Phytoplankton, Ponds, Water pollution effects.

The fluctuation of pH, Ca and bicarbonate con tents of water were influenced by dissolved CO2.

Invariably the concentration of Ca and bicarbonate were complementary to each other, but on certain occasions Na and Fe also behaved like Ca towards bicarbonate. The accumulation of soluble organic matter in water depended largely on the density of phytoplankton population and also on Mg and the Ca/Mg ratio. The concentration of nitrate increased in these waters either after the early rains or towards the end of monsoon season. Possibly it depended on the nature of the catchment area and on the intensity of bacterial activity. The salinity and total solid contents of water varied together. Waters sustained more total solids when the pH was around 7.8. The % sodium and % Cl + NO3 fluctuated directly with salinity and apparently indicated pollution of animal origin. Na and chlorides showed a direct relationship. (See also W72-01363)—Copyright 1972, Biological Abstracts, Inc. W73-10625

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SEASONAL CHANGES OF THE NUMBER OF SEASUNAL CHANGES OF THE NUMBER OF NITROGEN CYCLE BACTERIA IN BOTTOM SEDIMENTS OF A POOL, Polish Academy of Sciences, Warsaw. Inst. of Ex-perimental Biology. E. Fischer.

Pol Arch Hydrobiol. Vol 19, No 1, p 37-52. 1972.

Identifiers: Bacteria, *Bottom sediments, *Nitrogen bacteria, Pools, *Seasonal, Sediments.

The seasonal changes of the total number of bac-teria were investigated as well as those of bacterial groups taking part in the conversions of N com-pounds in the surface layers of bottom sediments pounds in the surface layers of bottom sediments in a pool of the Kampinos Forest. All groups of bacteria respond to factors affecting the whole community, but in different ways. Their densities in particular seasons of the year are different.—Copyright 1973, Biological Abstracts, Inc. W73-10641.

THE PHYTOPLANKTON OF LAKE OVRE HEIMDALSVATN, CENTRAL SOUTH NOR-WAY, 1969-70, Norwegian Inst. for Water Research, Oslo. Pal. Brettum.

Chlorophycene, Blooms. Identifiers: Chrysophyceae, Cryptophyceae, Lakes, Mountain lakes, *Norway, *Phytoplankton, Spring, *Lake Ovre Heimdalsvatn.

The quantitative and qualitative composition of phytoplankton in Lake Ovre Heimdalsvatn, a high mountain lake in Jotumheimen, was studied from July 1969 to Sept. 1970, with 18 vertical sampling series at 2 stations. Species within the classes Chrysophyceae, Chlorophyceae and Cryptophyceae predominated. The algal composition and total phytoplankton volume were very similar at the 2 stations throughout the year. The highest values of total volume, about 600 x 1,000,000 micro 3/1, occurred during the spring bloom.—Copyright 1973, Biological Abstracts, Inc. W73-10644

THE ROLE OF FLOOD FLOWS IN NUTRIENT SUPPLY AND REMOVAL AS A FACTOR IN THE EUTROPHICATION OF THE CONNEC-TICUT RIVER, New Hampshire Univ., Durham. C. Barksdale.

C. Barksdale.

In: Formation of Public Policy on Issue of Out-of-State Basin Diversion of Connecticut River Flood Waters to Boston Metropolitan Area, Massachusetts Water Resources Research Center, Publication No. 25, 1973. Appendix D, 19 p, 5 tab, 44 ref. OWRR C-2169 (No. 3377) (1).

Descriptors: *Flood flow, *Nutrients, *Eutrophication, Low flow, Urban runoff, Environmental effects, Pollution, *Connecticut River, *Diversion, *Inter-basin transfers. Identifiers: Long Island Sound.

A survey of available literature to determine the A survey of available intertaint to determine the role of flood flows in nutrient supply and removal in the Connecticut River Basin and their effect on the eutrophication of the river and the Long Island Sound is presented. The literature and data from

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Effects of Pollution—Group 5C

the U.S. Public Health Department permit the construction of discharge versus nutrient concentration graphs at two points on the Connecticut River, but do not enable definitive conclusions to be made with regard to eutrophication. The basic findings of the survey are that (1) flood flows increase the nutrient loads in the Connecticut River as they tend to flush out nutrients trapped during low flows; (2) urban and suburban areas are the greatest source of nutrients in the Connecticut River Basin; (3) impoundments along the river have a significant effect on the release of nutrients as the dams tend to trap materials having a deleterious effect on the Connecticut River water especially during low flow periods; and (4) further study is necessary to assets the degree of eutrophication of the River and Long Island Sound caused by flood flows. (See also W73-10726). (Elfers - North Carolina).

A STUDY OF THE PROBABLE EFFECTS OF THE DIVERSION OF FLOOD WATERS UPON THE ECOLOGY OF THE CONNECTICUT RIVER ESTUARY, Connecticut Univ., Storrs. For primary bibliographic entry see Field 02L. W73-10732

TRACE ELEMENT ANALYSES OF COLUMBIA RIVER WATER AND PHYTOPLANKTON, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs. For primary bibliographic entry see Field 05A. W73-10806

ZOOLOGICAL AND WILDLIFE REVIEWS: THE CONSERVA TION OF FISH, Huntingdon Research Centre (England). Dept. of Pesticides Science.
L. E. Mawdesley-Thomas, and W. D. Fraser.
Br Vet J. Vol 128, No 7, p 337-346, 1972. Illus. Identifiers: "Fish conservation, "Pesticides, Pollution, Reviews, Wildlife, Zoological studies, "Industrial wastes, Water pollution effects.

The problem of water pollution with industrial toxicants and pesticides and its effect on the conservation of fish is discussed.—Copyright 1973, Biological Abstracts, Inc. W73-10807

A COMPARISON OF MICROARTHROPOD POPULATIONS IN SEWAGE-EXPOSED AND SEWAGE-FREE SPARTINA SALT MARSHES, North Carolina Univ., Chapel Hill. Dept. of Zoolo-

E. A. McMahan, R. L. Knight, and A. R. Camp. Environ Entomol. Vol 1, No 2, p 244-252. 1972. Il-

ins. Identifiers: Amphipods, *Arthropods, Marshes, Populations, *Salt marshes, *Sewage effluents, *Spartina, Spiders.

An investigation of effects of sewage effluents on populations of microarthropods living in Spartina marshes was carried out in the spring and summer marshes was carried out in the spring and summer of 1970, using primarily a vacuum collecting technique. Comparisons of dominant forms, population densities, and species diversities were made between populations inhabiting marsh grass exposed to fooding by treated sewage wastes and those in nonpolluted areas. Only in the case of spiders and amphipods were significant differences found, with density in both cases being greater in the polluted marsh. Species diversity rerences found, with density in both cases being greater in the polluted march. Species diversity was relatively high, especially for populations from Spartina growing within margins of artificial ponds, some of which were also exposed to treated sewage wastes.—Copyright 1973, Biological Abstracts, Inc. W73-10814

GROWTH AND METABOLISM OF OSTREA EDULIS LARVAE, University Coll. of North Wales, Menai Bridge. Marine Science Labs. P. A. Gabbott, and D. L. Holland. Nature, Vol 241, No 5390, p 475-476, February 16, 1973, 3 tab, 9 ref

Descriptors: *Larvae, *Metabolism, *Energy budget, *Growth rates, Oysters, Efficiencies, Proteins, Carbohydrates, Lipids, Biochemistry, Mollusks, Invertebrates, Marine animals, Animal growth, Chemical analysis. Identifiers: *Ostrae adulis, Chemical composition, Isochrysis galbana, Tetraselmis suecica.

An energy budget has been calculated for Ostrea edulis larvae in terms of growth and metabolism from data on the changes in biochemical composition of the larvae during development and on the losses of body components during short-term starvation experiments. Three batches of larvae reared at the MAFF Fisheries Experiment Station were kept at 20-22 degrees C in aerated seawater, and fed a mixed algal diet of Isochrysis galbana and Tetraselmis suecica. On release day zero and days 4,8, and 12, samples of approximately 10-15,000 larvae were collected, counted, and analyzed for protein, lipid, and carbohydrate content. Further samples of larvae were taken from the main culture vessels and placed without food in aerated seawater for 48 h before biochemical analyzis. On release (days 0-2) the daily loss of body reserves was equivalent to an oxygen consumption rate of 0.0006 microliter 02 per larva per hr. The daily loss of reserves for days 4-6 and 8-10 was equivalent to oxygen consumption rates of 0.0025 and 0.005 microliter 02 per larva per hr respectively. The net growth efficiencies K2 for swimming larvae fell from 78.6 percent on release to 55.5 percent on day 10. The daily food requirements (assimilated ration) to support growth and metabolism represented 64.9 percent and 42.3 percent of the body weight on day 0 and day 10 respectively. (Holoman-Battelle)

GEOGRAPHIC DIFFERENCES IN PHYTOPLANKTON SENSITIVITY TO PCBS, Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
N. S. Fisher, L. B. Graham, E. J. Carpenter, and C. F. Wurster.
Nature, Vol 241, No 5391, p 548-549, February 23, 1973. 1 fig, 1 tab, 14 ref.

Descriptors: *Polychlorinated biphenyls, *Diatoms, *Toxicity, *Water pollution effects, Phytoplankton, Estuarine environment, Aquatic habitats, Chrysophyta, Marine algae, Continental shelf, Cultures, Plant growth. Identifiers: *Fragilaria pinnata, *Thalassiosira pseudonana, *Bellerochia, *Clones, Marine environment, Sensitivity, Sargasso Sea, Data interpretation, Oyster Pond, Great South Bay, Moriches Bay, Sample preservation.

An investigation has been made of the toxicity of PCBs to three species of diatoms, comparing clones isolated from the relatively stable Sargasso Sea waters with those from fluctuating estuarine environments. Cells of Thalassiosira pseudonans, Pragilaria pinnata and Bellerochia sp were grown axenically in f/2 medium. Exponentially growing cells were inoculated onto a sterile medium to which 10 ppb PCBs (Aroclor 1254) was added. The cultures were maintained at 20 degrees C and illustrations. which in pp P (128) (Arcion 129) was added. The cultures were maintained at 20 degrees C and illuminated 14 h/day; one-ml samples were fixed with Lugol's solution and counted with a Speirs-Levy eosinophil counter. Although growth of all seven clones tested diminished with PCB treatment, isolutes from the Sarasaso Sas invariable was the Sarasaso Sas invariable. closes tested diministed with PCB treatment, 150-lates from the Sargasso Sea invariably were more sensitive than were clones from estuaries and the continental shelf. Both Bellerochia clones were more sensitive than all others tested. Two-way analyses of variance on the logarithmically trans-formed data showed that, at 95 h, the interaction

term between PCB treatment and geographic origin was significant for T. pseudonana, and for Bellerochia sp., indicating algal sensitivity was highly dependent on the sites of isolation.

HEAVY METALS IN BRITISH WATERS, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab. For primary bibliographic entry see Field 05B. W73-10851

FROZEN PREPARED MICROBIOLOGICAL CULTURE MEDIA, Philadelphia Coll. of Pharmacy and Science, Pa. Dept. of Bacteriology. For primary bibliographic entry see Field 05A. For primar W73-10857

SLIME-INHABITING GEOFUNGI IN A POL-LUTED STREAM (WINTER/SPRING), Washington Univ., St. Louis, Mo. Dept. of Biolo-I. Noell.

Mycologia, Vol 65, No 1, p 57-66, January-February 1973. 1 fig, 4 tab, 13 ref.

Descriptors: *Water pollution, *Isolation, *Sewage effluents, Aquatic fungi, Missouri, Water sampling, Yeasts, Aquatic environment, Organic loading, Spatial distribution, Temporal distribution. distribution. Identifiers: "Geofungi, Hyphomycetes, Sugar Creek, Culture media, Selective media, Agars, Phycomycetes, Pusarium, Phoma, Cladosporium, Verticillium, Epicoccum, Glocladium, Alternaria, Acremonium, Aspergillus, Pestalotia, Curvularia, Geotrichum, Rhinocladiella, Diplodia, Cylindrocladium, Sporothrix, Paecilomyces, Ceratocystis capillifera, Ceratocystis moreau, Coprinus, Penicillium, Trichoderma.

Penicillium, Trichoderma.

Samples were taken biweekly for 4 months (winter to spring) from sites above and below the sewage effluent outfall in Sugar Creek (Missouri). Slime was removed with sterile implements from rocks in and 25 cm from the bank of the channel. After suspension in sterile water, small pieces were plated onto isolation medium. Colonies arising on the isolation medium were transferred to corn meal agar for identification. Species of Penicillium and allied genera were transferred to Czapek's solution agar for identification. Excluding Geotrichum and yeasts (ca. 400 ioslates), some 20 genera accounted for approximately 700 isolates. Numbers vary from 220 for Penicillium species to only eight for Curvularia. Species of several interesting genera were isolated only once or twice. These included Rhinocladiella, Diplodia, Cylindrocladium, Sporothrix, Paecilomyces, and two non-Hyphomycetes, Ceratocystis capillifera, C. moreau and a Coprinus sp. In addition, a few sterile forms and a variety of Phycomycetes were isolated. Of 689 isolates, 290, representing 42 percent of the total, were recovered from the channel; 399, or 58 percent, were recovered near the bank. Distribution of isolates by site and collection date cent of the total, were recovered from the channel; 399, or 38 percent, were recovered near the bank. Distribution of isolates by site and collection date shows temporal and spatical variation between genera. Distinct differences in number and type of isolates between channel and edge sites, and above and below the effluent outfall are noted. Problems of studying geofungi in aquatic systems and the significance of their presence are discussed. (Holoman-Battelle)

BIOLOGY OF SEA MUSSELS (MYTILUS CALIFORNIANUS (CONRAD) AND M. EDULIS (LINN.)) BEFORE AND AFFER THE SANTA BARBARA OIL SPIL. (1969), British Columbia Univ., Vancouver. Dept. of

J. R. E. Harger, and D. Straughan.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects of Pollution

Water, Air, and Soil Pollution, Vol 1, No 4, p 381-388, September 1972. 7 tab, 13 ref.

Descriptors: *Oil spills, *Water pollution effects,
*Mussels, Oil pollution, Biomass, Clams, Mollusks, Invertebrates, Shellfish.

Identifiers: *Mytilus californianus, *Mytilus edulis, *Santa Barbara oil spill, Macroinvertebretes, Data interpretation, Carpenteria Reef, Santa Barbara Harbor, Ellwood Pier, Goleta Point.

Effects of the 1969 Santa Barbara Oil Spill on sea mussels were investigated by comparing biomass characteristics of mussel populations in polluted and clean areas before, during, and after the discharge. In accordance with directions outlined by Connell (1971) the following null hypotheses were tested: (a) Mussels collected in August 1969 were tested: (a) Mussels collected in August 1995 from areas experiencing oil pollution were not lighter in body weight than those collected from the same locations in previous years. (b) Mussels collected from areas experiencing oil pollution in August 1969 were not lighter in body weight than those collected in subsequent years from the same locations. Animals in exposed areas were not significantly lighter in body weight than those in clean areas. Likewise no deleterious effect in the form of lowered body weights could be detected in mussels from polluted areas in three successive years subsequent to the oil spill. Mussels were not sampled until 7 mo after the initial spill so that any immediate deleterious effect generated by the oil could have been compensated for by the time of examination. It is noted that the spill in question occurred at a time of minimal growth on the part of the sea mussels involved and that an adverse response might have resulted if the oil had washed ashore during a period of heightened growth. (Holoman-Battelle) W73-10866

EFFECTS OF KRAFT MILL EFFLUENT ON A

MARINE BENTHIC COMMUNITY, Bedford Inst., Dartmouth (Nova Scotia) D. L. Peer. Water, Air, and Soil Pollution, Vol 1, No 4, p 359-

364, September 1972. 1 fig, 1 tab, 9 ref.

Descriptors: "Pulp wastes, "Water pollution effects, "Benthic fauna, "Biological communities, Bottom sampling, Sediments, Nematodes, Crustaceans, Annelids, Suspended solids, Marine animals, Speciation, Amphipoda, Isopods, Invertebrates, Flocculation, Effluents, *Canada.

Identifiers: *Marine environment, Data interpreta tion, Polychaetes, Nemerteans, Van Veen grab, Sample preservation, Cumacea, Scuds, Arthropods, Nephtys, Leanira, Glycera, Tellina agillis, Echinarachnius parma, Lumbrineris fragilis, Scolopios armiger, Laonice cirrata, Phyl-lodoce mucosa, Pholoe minuta, Tharyx acutus, Sternaspis fosser, Pectinaria hyperborea.

A quantitative survey of a marine benthic commu-nity was taken just prior to the discharge nearby of a bleached kraft paper mill and the area was surveyed again 2 yr later. Ten quantitative benthos samples were taken at each of three sites using a 0.1-m Van Veen bottom grab. The contents were sieved through an 0.8-mm mesh and the residue was preserved in a solution of 10 percent formalin and seawater. The animals were hand sorted from the sediment residue, separated into taxonomic groups, counted, blotted, and weighed. It was concluded that: there has been a change in the com-position of the benthic community since 1967; some of these changes may be accounted for by the reduction in tidal currents and resulting changes in sediment particle size composition; and the main cause of the changes is the flocculation of material from the mill effluent. It is not known whether the animals are responding to the physical effect of the flocculated material or to toxic compounds contained by it. (Holoman-Battelle) TOWARDS PRODUCTION BIOLOGY IN RUNNING WATER ECOSYSTEMS,
Freiburg Univ. (West Germany). Limnologisches Institut.

Verh Dtsch Zool Ges. 65, p 57-65, 1971. Illus. En-

glish summary. Identifiers: Algae, Bacteria, Biology, Ecosystems *Food chains, *Odagmia-Ornata, Pollution, Wate pollution effects, *Nutrients, Productivity.

Running waters are open steady state systems. The quantity of produced matter depends on the nutrients in the flowing water and the consumption of the primary produced or allochthonous matter by the secondary producers. The nutrient exchange between eviliment and water regulate the nutrition level in the downstream flowing water. The larvae of Simuliidae, for instance, shows that most of the drifting organic matter, detritus, algae, and bacteria, in the flowing water is well filtered but not used by the filtering consumers. The feeding rate of the larva of Odagmin ornata is 6.5 microgram dry weight yeast/animal. Nevertheless, bacteria are the most important basis for food chains in polluted running waters.—Copyright 1973, Biological Abstracts, Inc.

W73-10871

EFFECT OF SEAWATER SOLUBLE FRACTION OF KEROSENE ON CHEMOTAXIS IN MARINE SNAIL, NASSARIUS OBSOLETUS, Woods Hole Oceanographic Institution, Mass S. M. Jacobson, and D. B. Boylan. re, Vol 241, No 5386, p 213-215, January 19,

Descriptors: "Bioassay, "Snails, "Water pollution effects, "Oil pollution, "Animal physiology, Laboratory equipment, Invertebrates, Oil spills, Sea water, Marine animals. *Kerosene, Nassarius obsoletus, Naphthalene, Macroinvertebrates, Chemotaxis.

Two experiments were conduteed to determine the effect of soluble fractions of kerosene in seawater on the food-finding ability of the marine prosobranch snail, Nassarius obsoletus. Experiments were conducted in Y-shaped plastic chambers constructed so that flowing seawater entered at the two arms. One arm was randomly chosen to receive the stimulus, oyster extract in one experiment and scallop extract in the other. Snails were starved for 10 days prior to the test, and their movement was recorded in chambers containing seawater alone, attractant, kerosene extract, or atseawater alone, attractant, kerosene extract, or at seawater alone, attractant, kerosene extract, or attractant plus kerosene extract. Concentrations of oyster and scallop extracts were 0.33 ppm and 3 ppm, respectively. Kerosene extracts were prepared either by mixing with seawater and separating the aqueous and oil layers or by extracting four times with pentane. Concentrations used in the experiments were 1 and 4 ppm. The results show that minute quantities of seawater-soluble fractions of kerosene interfere with the chemically mediated attraction to food extracts in Nassarius. nediated attraction to food extracts in Nassarius mediated attraction to food extracts in reasonation obsoletus. Oil components may disrupt chemically mediated behavior of other organisms. Further study in this area is recommended. (Little-Battelle) W73-10872

VIBRIO DISTRIBUTION OF VIBRIO PARAHAEMOLYTICUS IN THE NATURAL EN-VIRONMENT,
Washington Univ., Seattle. Inst. for Food Science
and Technology.
For primary bibliographic entry see Field 05B.
W73-10875

ECOLOGICAL SIGNIFICANCE OF THE DISCHARGE OF TREATED WASTE WATERS INTO COASTAL WATERS, Southern California Coastal Water Research ProG. E. Hlavka Journal of Milk and Food Technology, Vol 36, No 1, p 23-27, January 1973. 1 fig, 1 tab, 1 ref. cy pr

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1, p 23-27, January 1973. 1 fig, 1 tab, 1 ref.

Descriptors: "Waste water (Pollution), Waste treatment, Water pollution effects, Water pollution sources, "Water quality standards, Research and development, "Waste identification, "Multiple-purpose projects, "Pollutants, Path of pollutants, Bioindicators, Aquatic life, Water analysis, Ecology, Ecological distribution, Environmental effects, Sediments, Soil analysis, Aquatic soils, Chemical analysis, Trace elements, Heavy metals, Radioisotopes, Oil spills, Water sampling, Coliforms, Marine fish, Invertebrates, Mollusks, Shellfish, Clams, Gastropods, Eutrophication, DDT, Lead, Bioassay, Biota, Fishparasites, Fish diseases, Benthos, Laboratory tests. Identifiers: "Coastal waters, "Southern Californianus, Pollicipes polymerus, Pisaster ochraceus, Macroinvertebrates, Paralabrax nebulifer, Sand bass, Oryzias latipes, Japanese rice fish.

The Southern California Coastal Water Research Project (SCCWRP) is attempting to attain a substantial understanding of the ecology of the coastal waters of Southern California. The goals and objectives of the project are to: (a) determine the input rates and distribution of the substantial and trace-level organic and inorganic materials entering the coastal waters; (b) investigate the natural phenomena of the Southern California Bight in research and present insections (c) determine the effects. phenomena of the Southern California Bight in present and recent times; (c) determine the effects of man on the coastal waters and distinguish them from natural phenomena; (d) develop indices of environmental health; (e) develop the capacity to predict man-induced effects on the coastal waters; and (f) determine the methods by which the coastal water environment may be enhanced. The findings should be useful in efforts to limit harmful dings should be useful in efforts to limit harmful findings should be useful in efforts to limit harmful effects and to promote enchancement of the coastal environment. The major effort thus far has been an information search in 17 task areas of physical and chemical oceanography, marine biology, and environmental engineering. In addition, several new research projects have been started under SCCWRP direction. Discussed are some of the technical problems associated with such an effort such as quantifying the natural fluctuations of physical, chemical, and biological parameters; establishing environmental criteris; and correlating observed effects with pollutant distributions. (Holoman-Battelle) W73-10876

REDUCTION OF MERCURY WITH CYSTEINE IN COMMINUTED HALIBUT AND HAKE FISH

PROTEIN CONCENTRATE, National Marine Fisheries Service, Seattle, Wash. Pacific Fishery Products Technology Center. J. Spinelli, M. A. Steinberg, R. Miller, A. Hall, and

Journal of Agricultural and Food Chemistry, Vol 21, No 2, p 264-268, March/April 1973. 5 fig, 6 tab,

Descriptors: *Separation techniques, *Mercury, *Fish, Hydrogen ion concentration.

Identifiers: *Biological samples, *Cysteine, Removal, Sample preparation.

A study was made to determine the effectiveness of cysteine in reducing the mercury content of comminuted fish and fish protein concentrate (FPC). Comminuted fish tissue was extracted with 0.1 M NaCl containing cysteine HCLH2O in concentrations ranging from 0 to 0.5 percent. The amount of Hg that could be extracted from the fish was related to the concentrations of cysteine and the pH of the tissue, but the relation was not linear. The most efficient use of cysteine in reducing the Hg content of comminuted fish was obtained when the cysteine-containing extraction solution was percolated through the fish contained in the column. When cysteine was used in an aque-A study was made to determine the effectiveness

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

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ous system, only minimal cysteine (4-8 percent) residues were left in the product, indicating that cysteine does not bind irreversibly with the fish proteins. (Little-Battelle)

A SEARCH: NEW TECHNOLOGY FOR PAVE-MENT SNOW AND ICE CONTROL, Abt Associates, Inc., Cambridge, Mass. For primary bibliographic entry see Field 05G. W73-10883

PESTICIDE-SEDIMENT-WATER INTERAC-

TIONS, Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research

For primary bibliographic entry see Field 05B.

THE EUTROPHICATION IMPLICATIONS OF INTERACTIONS BETWEEN NATURALLY OC-CURRING PARTICULATES AND METHANE OXIDIZING BACTERIA, Ohio State Univ., Columbus. Dept. of Microbiolo-

gy. T. L. Weaver, and P. R. Dugan. Water Research, Vol 6, No 7, p 817-828, 1972. 10 fig, 1 tab, 8 ref. OWRR A-027-OHIO (1).

Descriptors: *Methane, *Eutrophication, *Kaolinite, *Oxidation, *Clay minerals, Carbon, Algae, Land management, Bacteria, Carbon dioxide, Inorganic compounds, Diatoms, Suspended solids, Cycling nutrients, Particle size, Organic compounds, Nutrient removal. Identifiers: Methane carbon, Particulate matter, Methane cidetion.

One of the main factors affecting methane carbon recycling and thereby eutrophication is the variety and quantity of suspended particulate material in the water column. Oxidation of methane by bacteria is markedly affected by organic and inorganic particulate materials which largely determine how much methane will be oxidized and retained in the aquatic ecosystem. Methane oxidation, in turn, greatly influences carbon accumulation which will greatly influences carbon accumulation which will at least partially govern the rate of eutrophication. The effects of various types of clays on methane oxidation are compared. It can be postulated that the type of non-clay insoluble inorganic particulates existing in a body of water can have an important effect on methane carbon retention. In studying effects of constantly illuminated algae upon methane oxidation, varying degrees of inhibition were observed with Anacystis nidulans, Chlorella vulgaris. and Anabaena variabilis whereas vulgaris, and Anabaena variabilis whereas Schizothrix calciocola had no effect on methane uptake. It was also evident from control experients that algal cells alone do not take up det means man agai cells aione do not take up detecta-ble quantities of methane. Suggestions are given for several 'particulate management' practices to partially control eutrophication. Another specula-tion would be seeding lakes with algae known to inhibit methane oxidation. (Jones-Wisconsin) W73-10893

COMPETITION BETWEEN AN ALGA AND AN AQUATIC BACTERIUM FOR PHOSPHATE, Cornell Univ., Ithaca, N.Y.

G-Y. Rhee. Limnology and Oceanography, Vol 17, No 4, p 505-514, 1972. 5 fig, 4 tab, 34 ref. OWRR B-024-

Descriptors: *Competition, *Algae, *Aquatic bacteria, *Phosphates, *Scendesumus, *Pseudomonas, Phytoplankton, Growth rates, Limiting

Whether phytoplankton are capable of competing with aquatic bacteria for phosphates in vitro, the

mechanism of such action, and the physiological basis of their competitive ability were determined. Scenedesmus and Pseudomonas were grown in pure and mixed cultures. Growth of each in the mixed culture was compared to that in pure cultures and phosphate removal from the media was followed at the same time. Specific growth rates of algae and bacteria in various phosphate concentrations and their increase in volume and number were measured. Algal growth was severely limited in the presence of bacteria, but bacterial growth was hardly affected by algae. First sign of competition in mixed cultures (cessation of exponential algal growth) was always observed some time after the external phosphate had been exhausted. The faster growth rate of bacteria accounted for after the external phosphate had been exhausted. The faster growth rate of bacteria accounted for the suppressed growth of the algae in mixed cultures. The first sign of competition in algae appeared when the concentration of surplus phosphorus within the algal cell dropped to a critical value near zero. The surplus phosphorus appeared to consist of three or all four inorganic polyphosphate fractions. (Jones-Wisconsin) W73-10894

PRODUCTIVITY PROBLEMS OF FRESH-

WATERS.
Polish Academy of Sciences, Warsaw. Inst. of Ecology.

Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimerz Dolny, Poland. PWN Polish Scientific Publishers, Warsaw, 918 p, 1972. 58 fig,

Descriptors: *Productivity, *Eutrophication, *Food chains, Primary productivity, Secondary productivity, Ecology, Fish management, Fertilization, Trophic level, Organic matter, Water pollution, Self-purification, Biodegradation, Energy budget, Mathematical studies, Statistical models, Simulation analysis, Ecosystems. Identifiers: International Biological Program, INDESCO.

Participants in this symposium included 94 raticipatis in this symposium included y-scientists from 27 countries of Europe, America, Asia, Africa, and Australia, in addition to a large number of Polish hydrobiologists, who presented production studies as undertaken in their countries within the framework of the IBP. Of special significant of the production of the IBP. production studies as undertaken in their countries within the framework of the IBP. Of special significance was the appraisal of particular problems by working groups arranged as follows: Primary production and efficiency of its utilization, Secondary production and efficiency of its utilization including fish production, Organic matter transformation and microbiological processes in biological budgets of waters, Production studies as an aid in dealing with manmade changes in waters (eutrophication, pollution, selfpurification), Bioenergetics of aquatic organisms as a background for understanding production process in natural waters, and general problems—Biological budgets of water bodies. The first step toward application of mathematical theories of systems and mathematical simulations of ecosystems has been taken, and contributions are included, although the gap was not completely closed between the description and understanding, between the empiracal assembly of facts and theoretical conclusions. The contents are divided into general categories, titled 'Production studies on the whole ecosystem or at least two trophic into general categories, tutied Production studies on the whole ecosystem or at least two trophic levels, 'One level production studies and particu-lar production problems,' and 'Regional studies and surveys.' (See W73-10896 thru W73-10933) (Auen-Wisconsin)

BIOLOGICAL PRODUCTIVITY OF LAKES KRIVOE AND KRUGLOE, Akademiya Nauk SSSR, Leningrad. Zoologicheskii Instut. A. F. Alimov, V. V. Boullion, N. P. Finogenova, M. B. Ivanova, and N. K. Kuzmitskaya.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Fresh waters, May 6-12, 1970, Kazimerz Dolny, Poland, p 35-56, 1972. 3 fig. 14 tab, 9 ref.

Descriptors: "Productivity, "Primary productivity, "Energy budget, Phytoplankton, Benthic fauna, Zooplanton, Organic matter, Biomass, Biological communities, Cold regions, Animal metabolism, Energy conversion, Energy transfer, Photosynthesis, Benthos, Diatoms.
Identifiers: "Lake Krivoe (Karelia), "Lake Krugloe (Karelia), Energy values.

Studies were made of the biological productivity in Lakes Krivoe (oligotrophic) and Krugloe (bog lake) on the White Sea coast of Karelia, 30 km south of the Polar Circle. A negative balance of organic matter is typical of both lakes and both are poor in cutrients. They have low values of primary production which are represented mainly by phytoplankton with almost no higher water plants and a weak periphyton. The maximum plankton photosynthesis was observed in the surface water; photosynthesis rapidly decreases with depth, especially in the less transparent Lake Krugloe. Excess destruction over production indicates a great role of allochthonous organic matter in the biological budget. Of the 128 algal taxa (six types), the dominant species belong to cosmopolitan albiological budget. Of the 128 algal taxa (six types), the dominant species belong to cosmopolitan algae: Significant are the northern Alpian forms of Melosira and Dinobryon. Diatom species amount to almost 70%, largely rare forms. Zooplankton of both lakes include 23 Rotatoria, 9 Cladocera, 2 Copepoda. Benthic animals consist mainly of widely distributed holarctic and palaearctic species, some typical of cold water habitats. The profundal of Lake Krivoe is inhabited by glacial relicts. Benthos is characteristic of the somewhat impoverished fauna of northern Karelia. The main elements of the energy budget of these waters are tabulated. (See also W73-10895) (Auen-Wisconsin) W73-10895)

THE SEASONAL VARIATION OF SOME ECOLOGICAL REFICIENCIES AND PRODUCTION RATES IN THE PLANKTON COMMUNITY OF SEVERAL POLISH LAKES OF DIFFERENT TROPHY, Polish Academy of Sciences, Warsaw. Inst. of

Polian Academy of Sciences, Warsaw. Inst. of Ecology.

A. Hillbricht-Ilkowska, I. Spodniewska, T.

Weglenska, and A. Karabin.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimerz Dolny, Poland, p 111-127, 1972. 5 fig, 1 tab, 29 ref.

Descriptors: "Productivity, "Seasonal, "Primary productivity, "Phytoplankton, "Zooplankton, "Trophic level, Predation, Photosynthesis, Nan-noplankton, Plankton, Biomass, Crustaceans,

noplankton, Plankton, Biomass, Crustaceans, Biological communities. Identifiers: "Poland, Mikolajskie Lake (Poland), Taltowisko Lake (Poland), Sniardwy Lake (Poland), Flosek Lake (Poland).

Analysis was made of environmental and seasonal variation of primary production (Phytoplankton), production of filter-feeders (non-predatory zooplankton), and production of planktonic predators in lakes Mikolajskie (eutrophic, halomictic), Sniardwy (eutrophic, palimictic), Taltowisko (mesotrophic, halomictic) and Flosek (dystrophic) of Poland. Biomass of phyto- and nannoplankton was estimated; production and biomass of rotifers and crustaceans were calculated separately. To determine extent of consumer food supply utilization, two groups were distinguished having a different range of food selectivity—microconsumers and macroconsumers. Lakes of a lower trophic ferent range of food selectivity-microconsumers and macroconsumers. Lakes of a lower trophic status showed greater phtosynthetic effeciency and nannoplankton share in production when com-pared with a typically eutrophic lake. Net produc-tion of filter feeders in eutrophic, mesotrophic and dystrophic lakes was similar and rather large, while it was strikingly small in the dystrophic lake

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constantly and strongly mixed. The data from a special experiment in situ and calculated interlevel efficiencies were used to analyze the extent of utilation of phytoplankton production, including that of nannoplankton, by filter feeders and the that of nannoplankton, by filter feeders and the reduction of the latter by predators. The variation of the values of production rates, the mean daily P/B coefficient, was also analyzed for successive links in the production process. (See also W73-10895) (Jones-Wisconsin) W73-10895)

THE PRODUCTION PROCESSES IN SEVERAL

POLISH LAKES, Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology; and Warsaw Univ. (Poland). Dept. of Hydrobiology.

of Hydrobiology.

A. Kajak, A. Hillbricht-Ilkowska, and E.

A. Rajak, A. Filiprical-likowska, and E. Pieczynska. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimerz Dolny, Poland, p 129-147, 1972. 1 fig, 7 tab, 46 ref.

Descriptors: "Productivity, "Secondary productivity, "Primary productivity, Zooplankton, Benthic fauna, Littoral, Plankton, Tripton, Decomposing organic matter, Epilimnion, Hypolimnion, Bottom sediments, Organic matter, Biomass, Biological communities, Benthos, Biodegradation, Periphyton, Aquatic plants, Profundal zone, Photosynthesis, Phytoplankton. Identifiers: Mikolajskie Lake (Poland), Taltowisko Lake (Poland), Sniardwy Lake (Poland), Plosek Lake (Poland), Warniak Lake (Poland), Pelasic zone.

Production processes of five Masurian, trophically different, lakes were examined by detailed analysis of production, biomass and trophic relations among particular groups of organisms and dominating species, by estimating organic matter, input and output, and by comparing primary production and tripton sedimentation. The pelagic zone is of greatest significance in organic matter production: in Mikolajskie Lake net primary production in the littoral zone forms 21%, and in the pelagic zone 79% of the total lake primary production. Zooplankton productivity greatly ex-ceeds that of zoobenthos. About 30% of net primaceeds that of zoobenthos. About 30% of net primary production is sedimentated as tripton, most of which is decomposed in bottom deposits. Efficiency of benthos production relative to tripton is similar to efficiency of zooplankton relative to primary production. Total net primary production plus allochthonous organic matter is efficiently utilized in secondary production, including the roughly-estimated production of heterotrophic bacteria. Decomposition takes place mainly in the epilimnion. Significance of hypolimnion and of bottom deposits in decomposition processes is similar and not great. Decomposition is intensive in eulittoral, but, since the eulittoral is only a small part of the entire lake, its share in the total decomposit of the processes is the second of the processes in the control of the processes is smallar and not great. Decomposition is intensive in eulittoral, but, since the eulittoral is only a small part of the entire lake, its share in the total decompart of the entire lake, its share in the total decomposition processes is not especially significant. (See also W73-10895) (Jones-Wisconsin)

THE MODELLING OF THE ECOSYSTEM OF LAKE DALNEE ON AN ELECTRONIC COM-

V. Krogius, E. M. Krokhin, and V. V. Menshutkin.

Mensiouxin.
In: Proceedings of the IBP-UNESCO Symposium
on Productivity Problems of Freshwaters, May 612, 1970, Kazimerz Dolny, Poland, p 149-164,
1972-9 fig, 1 tab, 50 ref.

Descriptors: *Productivity, *Model studies, *Ecosystems, *Input-Output analysis, Computers, Primary productivity, Fish, Seasonal, Energy transfer, Organic matter, Respiration, Predation, Dynamics, Biomass. Identifiers: *Lake Kamachatka (USSR). Dalnee (Kamchatka), The first experience in modelling the whole ecosystem of Lake Dalnee, Kamchatka, USSR, was carried out as a composition of finite automatons with description of the modelling algorithm in the language of logic algebra. On this first model was traced the whole path leading to the solution of the problem of optimum utilization of the natural resources of lakes. The objective of the investigation was not so much to solve, as to demonstrate the possibility of a quantitative solution of the problem of rational utilization of the biological, hydroenergetical and other resources of natural bodies of water. The basic indices of the annual biotic balance of the ecosystem of Lake Dalnee and the corresponding data obtained are presented. In proceeding from mere relative values: coefficients of exchange expenditures, natural mortality, maximum rations and some others (selected not always on a sufficiently theoretical basis, especially in respect to bacteria) as well as from the temperature and light regime of the lake, a plausible dynamic picture of the lake ecosystem was obtained. This offers a basis for the problem of potimum control of lake ecosystems, not very reliable, but fundamental. (See also W73-10895) (Jones-Wisconsin) W73-10899)

BIOLOGICAL PRODUCTIVITY AND BALANCE

UF ORGANIC SUBSTANCE AND ENERGY IN LAKE BAIKAL, B. K. Moskalenko, and K. K. Votinsev. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 207-226, 1972. 9 fig, 13 tab, 3 ref.

Descriptors: *Productivity, *Organic matter, *Energy budget, Biomass, Food chains, Solar radiation, Zooplankton, Fish, Respiration, Primary productivity, Bullheads. Identifiers: *Lake Baikal (USSR), Pelagic zone, Comephorus, Seals, Coregonus autunalis.

Results of long-term complex investigations on biological productivity of the pelagic zone of oligotrophic Lake Baikal, USSR, are presented. Biomass volume, production regularities within the major groups of pelagic complex organisms, change in the numerical density and changeability the major groups of pelagic complex organisms, change in the numerical density and changeability of species in space and time, organism-environment relations and nutritional links between the organisms in different trophic levels were studied to arrive at conclusions for the prospects of increasing profitability of the fish economy. Average microalgal biomass and its seasonal fluctuations are given. The dominant organism of the Baikal zooplankton is the copepod, Epischura balcalensis; in deep water its biomass in summer is from 80 - 95% of the total zooplankton biomass. The fish population of the Baikal pelagial zone is chiefly composed of endemics: two species of pelagic bullheads and two Comephorus species. The ways of increasing the economically-profitable output are to increase growth of the Coregonus flock by intensifying natural reproduction and by artificial breeding. Also introduction of new species of fish should not interfere with the historically developed ichthiofauna complex. Estimations show that Lake Baikal can be converted into a large-scale industry of freshwater salmons and Coregonus. (See also W73-10895) (Jones-Wisconsin) W73-10900

DISTRIBUTION PATTERN OF PHYTOPLANK-TON AND BACTERIA, MICROBIAL DECOM-POSITION OF ORGANIC MATTER AND BAC-TERIAL PRODUCTION IN EUTROPHIC, STRATIFIED LAKE,
Max-Planck-Institut fuer Limnologie zu Ploen
(West Germany).
J. Overbeck.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 227-237. 1972. 6 fig, 1 tab, 23 ref.

Descriptors: "Productivity, "Distribution patterns "Phytoplankton, "Bacteria, "Microbial degradation, Eutrophication, Stratification, Organismatter, Metabolism, Pood chains, Energy transfer, Plant physiology, Kinetics, Model studies Biomass Identifiers: Plussee (Plon), Germany.

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Studies on heterotrophic bacteria in eutrophic Plusee, Germany, are presented, especially the physiological mechanisms. The mean percent share of carbon dioxide-dark fixation in the bacterial biomass in the lake amounts to 6.6. Assuming the mean part of heterotrophic C-14 fixation in bacterial biomass as 6, the heterotrophic production can be calculated by measuring the heterotrophic carbon dioxide-fixation, although exact physiological studies are still to be performed. Autotrophic production occurs in the supper zone of the lake. These processes are inportant since the organic substance, liberated by autolysis of excretion of phytoplankton, is converted at once into particulate substance and is thus available to herbivore zooplankton. Data for an extensive computer analysis of distribution pattern of phytoplankton and bacteria were prepared. In the first half of summer, with remarkable autotrophic production in the epilimaion, a significant correlation of the biomass of bacteria to the phytoplankton was observed. After interruption of autotrophic production by phosphate depletion, the bacterial biomass dropped down to the hypolimnion and was correlated with phototrophic bacteria. Application of kinetic parameters for determination of microbial activities in water bodies offers a dynamic approach to aquatic microbiology and supplements computer calculations. (See also W73-10895) (Jones-Wisconsin) W73-10901

THE PRODUCTION PROCESSES IN TWO HIGH-MOUNTAIN LAKES (VOR-DERER AND HINTERER FINSTERTALER SEE, KUHTAI,

HINTERER FINSTERTALER SEE, KUHTAI, AUSTRIA), Innsbruck Univ. (Austria). Inst. of Zoology. G. Bretschko, P. Gollmann, H. Pfeifer, R. Pechlaner, and H. P. Weissenbach. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 239-269. 1972. 29 fig. 2 tab, 14 ref.

Descriptors: *Productivity, *Alpine, *Lakes, *Energy transfer, Phytoplankton, Nannoplankton, Bacteria, Rotifers, Copepods, Benthic fauna, Fish, Water chemistry, Primary productivity, Photosynthesis, Benthos, Periphyton. Identifiers: Finstertaler See Kuhtai (Austria).

Identifiers: Finstertaler See Kuhtai (Austria).

Vorderer and Hinterer Finstertaler See, lying above the timber line of the Central Alps at elevations of 2237 and 2256 meters were studied as type specimens of high-mountain lakes as models for more complex water bodies. Temperature, water chemistry, radiation, phytoplankton, bottom flora, bottom fauna and fish were evaluated. Species composition of phytoplankton does not change essentially throughout the year, therefore differences in the activity coefficient are mainly due to alterations in environmental factors and physiological properties of the taxa concerned. Among the environmental factors light intensity and nutrient (phosphorus) limitations control phytoplankton production rates in the course of the year. Biomass of bacteria in both lakes is only slightly smaller than standing crops found in lowland lakes and is in the same order of magnitude as phytoplankton. Secchi disc transparencies have been plotted as there could be causal relations between turbidity and bacterial concentration. The zooplankton community is extremely simple: two rotifers and a single copepod form about 99% of the zooplankton. The terminal producers of both lakes are two salmonids, Salmo trutta f, fario and Salvelinus alpinus. (See also W73-10895) (Jones-Wisconsin)

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WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

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PRODUCTION AND DECOMPOSITION IN THE EULITTORAL ZONE OF LAKES, Warsaw Univ. (Poland). Dept. of Hydrobiology.

watnaw Univ. (Poland). Dept. of Hydrobiology. E. Pieczynska. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970. Kazimierz Dolny, Poland, p 271-285. 1972. 1 fig. 3 tab, 15 ref.

Descriptors: "Primary productivity, "Productivi-ty, "Decomposing organic matter, "Energy transfer, "Littoral, Lakes, Organic matter, Water levels. Identifiers: Masurian Lake District (Poland), Eu-

The eulittoral is a transitional zone between lake and surrounding land, that area between maximal and minimal water level and neighboring areas, plashed or exposed by waves. This zone was studied in several lakes of the Masurian Lake Distric in Northern Poland. Its sources of organic matter are distinguished: productivity of the area, organic matter brought from the lake, and organic matter of terrestrial origin. Rate of decomposition of the several kinds of organic matter and the ways they participate in the energy flow are discussed. Two basic aspects of eulittoral energy flow can be distinguished. It is a zone characterized by intensive primary production and determines largely productivity of the water body. Main factors affecting the eulittoral are configuration of shore terproductivity of the water body. Main lactors affecting the culittoral are configuration of shore terrace, shore line development and water level fluctuations. Secondly, the culittoral stores various kinds of matter of terrestrial and lake origin, and the company free leaves. requently difficult to decompose (tree leaves, macrophytes), not used as direct food by consumers. This matter, after partial decomposition, when hydrological conditions change (changes in the water level), gets into the other lake zones in a reduced amount but in a form accessible for the consumers. (See also W73-10895) (Jones-Wiscon-W73-10903

THE CHAR LAKE PROJECT. A STUDY OF ENERGY FLOW IN A HIGH ARCTIC LAKE, Toronto Univ. (Ontario). Dept. of Zoology.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 287-300. 1972. 5 fig., 3 ub, 17 ref.

Descriptors: *Productivity, *Energy budget, *Arctic, *Lakes, Geology, Climates, Water chemistry, Physical properties, Nutrient, Zooplankton, Alagae, Benthos, Conductivity, Phytoplankton, Nanoplankton, Biological communities, Protozoans, Fish, Mosses, Crustaceans, Thermal properties, Limiting factors.

Identifiers: *Char Lake (Canada).

Biological simplicity of arctic lakes, ideal for stu-dies to quantitate energy flow through a food chain, combined with their constant thermal regime, makes them excellent for testing hypotheses concerning the relation between biological diversity and stability. Char Lake, Corn-wallis Island, Canada, was investigated and its geology, climate, morphometry, and simple chemical characteristics are described. In general, the communities are much less diverse than those in a comparable temperate lake. Net phytoplankton is sparse with nannoplanktonic flagellates and diatoms the dominant groups. Zooplankton is sparse; Limocalanus macrurus and Keratella cochlearis are the only multicellular apparent. sparse; Limnocalanus macrurus and Keratella cochlearis are the only multicellular species and are present throughout the year. Ciliated protozoans are abundant but unidentified. The only fish is Salvelinus alpinus; the population is land locked. The benthic community is also simple; the only macrophytes are mosses. Eighteen species of invertebrates are known to occur in benthic communities and seven more thought to wash in from streams. Comparative studies of productivity and phosphate uptake kinetics

between Char Lake and a fertilized lake suggest that productivity is nutrient limited, but that arctic lakes cannot respond as dramatically as temperate lakes to large nutrient inputs. (See also W73-10895) (Jones-Wiaconsin) W73-10904

LAKE GEORGE, UGANDA. STUDIES ON A TROPICAL FRESHWATER ECOSYSTEM. Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 301-309. 1972. 4 fig, 6 tab, 11 ref.

Descriptors: "Tropical regions, "Biological communities, "Energy conversion, "Productivity, Lakes, Physicochemical properties, Shallow water, Respiration, Cycling nutrients, Energy transfer, Biomass, Primary productivity, Secondary productivity ry productivity. Identifiers: *Lake George (Uganda).

The initial aims of the study were to describe the physical, chemical, and biological conditions in a tropical lake (exemplified by Lake George) and subsequently to investigate the major components of production of selected trophic levels. Preliminary work dealt with hydrology, water chemistry, primary productivity, nutrient flow through the lake, and the ecology of zooplankton, benthic diptera, and fish. Phytoplankton utilization of the bicarbonate ion as a direct carbon source results in a high daily rate of gross production. The equilibrium concentrations of dissolved inorganic nitrogen and phosphorus are always low but rate of supply must be sufficient to maintain the low net productivity. An unusual contribution to this lake are the faeces of a large Hippopotamus which frequent the lake. Ratio of the post-primary biomass to that of the primary producers is very small, probably because of an inefficient energy link between the trophic levels due to the energy transfer occurring through the detritial cycle. Fish populations are divided into two groups: species growing to a large tarough the detrical cycle. Fish populations are di-vided into two groups; species growing to a large size and those of small adult size. One species only, Tilapia nilotica, a herbivore, makes up 80% of the considerable fish harvest. (See also W73-10895) (Jones-Wisconsin) W73-10905

FUNCTIONS AND INTERACTIONS OF DIS-SOLVED ORGANIC MATTER AND THE LITTORAL ZONE IN LAKE METABOLISM AND

TORAL ZONE IN LAKE METABOLISM AND EUTROPHICATION, Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station. R. G. Wetzel, and H. L. Allen. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 333-347. 1972. 4 fig, 2 tab, 51 ref.

Descriptors: "Productivity, "Organic matter, "Littoral, "Lakes, "Eutrophication, Aquatic plants, Energy budget, Marl, Decomposing organic matter, Cycling nutrients. Identifiers: "Dissolved organic matter, Lawrence Lake (Michigan).

Recent findings from marl lakes indicate Recent findings from marl lakes indicate mechanisms involved in the functional roles of dissolved organic matter in relation to the producers of aquatic systems where the inorganic milities severely suppresses facets of dissolved organic matter cycling and potential productivity. Changes in cycling and partitioning of dissolved organic matter are significant in lake eutrophication and ontogeny. In spite of large reservoirs of inorganic carbon in marl lakes, the highly buffered, alkaline conditions limit availability of carbon to algal and macrophytic photosynthesis. Critical to increased eutrophication is some mechanism of decreasing

buffering capacity and carbonate reservoir. Morphometric changes accompanying gradual net increases in sedimentation rates also have signifi-cant effects. In closed basins of moderate to small cant effects. In closed basins of moderate to small size, marl lake succession can be altered relatively rapidly by the littoral flora, particularly Sphagnum. Supporting data from several lake types are discussed in evidence for interaction models of functional roles of dissolved organic matter in eutrophication ontogeny of lake production stability and maturation. The littoral complex functions as a source of dissolved organic matter that potentially can affect and regulate pelagial autotrophy. Moreover, the littoral zone functions as a chemical and metabolic trap or 'sieve' for allochthonous dissolved and particulate organic and inorganic matter. (See also W73-10895) (Jones-Wisconsin) W73-10906

THE UNIQUENESS OF SALT LAKE ECOSYSTEMS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
W. D. Williams.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 349-361, 1972. 1 tab, 66 ref.

Descriptors: "Productivity, "Saline lakes, "Ecosystems, "Limnology, Biological communities, Primary productivity, Secondary productivity, Laboratory tests, Energy transfer. Identifiers: Trophic dynamics, Soap Lake (Wash), Lake Werswrap (Austrailia), Lake Rudolph (E. Africa), Alviso Salterns (Calif).

Attention is focused on the somewhat odd position that inland salt waters occupy in the limnological spectrum. Salt lakes are discrete, simplified, and spectrum. Sait lakes are discrete, simplified, and sometimes very productive ecosystems which provide a spectrum of ecosystem stability and complexity. This paper reviews research on the unique features characterizing inland salt lakes and their biota. The small number of projects dealing with the trophic dynamic relationships of a total ecosystem testify that ecosystems are complex units. Salt lakes have greatly decreased spe diversities vis-a-vis freshwater localities, and in the most saline lakes, extremely few species oc-cur. They are, insofar as the dynamics of water (apart from evaporation) and energy flow are con-cerned, closed systems, perhaps more discrete than any other ecosystem of similar size. Most salt than any other ecosystem of similar size. Most salt lakes are relatively shallow and this results in decreased habitat heterogeneity. The reduced species diversity and simplified trophic structure derived from the absence of fish and macrophytes and the presence of decreased habitat heterogeneity of salt lakes make them considerably less dificult to study. The major producers appear to be periphytic and planktonic algae. The large recorded values for benthic and zooplankton standing crops are further indication of high standing crops are further indication of high secondary production. (See also W73-10895) (Jones-Wisconsin) (Jones-Wise W73-10907

SOME INTERIM RESULTS OF SOVIET IBP IN-SOME INTERIM RESULTS
VESTIGATIONS ON LAKES,
Nauk SSSR,

Akademiya Nauk SSSR, Leningrad.
Zoologicheskii Institut.
G. G. Winberg.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwater, May 6-12, 1970, Kazimierz Dolny, Poland, p 363-381.
1972. 8 fig, 4 tab.

Descriptors: *Productivity, *Lakes, *Energy budget, *Biomass, Primary productivity, Food chains, Respiration, Bacteria, Plankton, Preda-tion, Zooplankton, Benthic fauna, Fish, Trophic level, Phytoplankton. Identifiers: *USSR, Lake Drivyati (USSR), Lake Krivoe (USSR), Lake Krugloe (USSR), Lake

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION **Group 5C—Effects of Pollution**

Krasnoe (USSR), Lake Naroch (Byelorussia), Lake Myastro (Byelorussia), Rybinsk Reservoir (USSR), Kiev Reservoir (USSR).

Water bodies of various types and different geographical locations were investigated: Lakes Krivoe and Krugloe near the Polar Circle, Lake Krasnoe near Leningrad, three Byelorussian lakes, Lake Drivyadi, Rybinsk Reservoir on the Volga River, and the Kiev Reservoir on the Polieper River. The basic parameters of the energy budget (biomass, production, food ration, respiration) of successive trophic links (producers, bacterioplankton, non-predatory and predatory zooplankton and zoobenthos, fish), the coefficients PfB, and some ecological efficiencies are presented and discussed. The trophic levels of energy utilization should be particularly considered Quantitative studies of the energy flow should be continued and the applied methods will enable one to clarify both the common characters of the biological energy budget of aquatic enance one to ctarify both the common characters of the biological energy budget of aquatic ecosystems and its typical characters in water bodies of different types. Special attention should be given to the effect of animals of each trophic level on the composition and biological peculiarities of the preceding one. This facet of interrelationships in the grounder cap be repeated as ties of the precenting one. This facet of interrela-tionships in the ecosystem can be regarded as a flow of information running in the direction op-posite to the energy flow and together with abiotic factors determining the specific composition and characters of organisms of the trophic level. (See also W73-10895) (Jones-Wisconsin)

BIOLOGICAL PRODUCTIVITY OF DIFFERENT TYPES OF LAKES, FERENT TYPES OF LAKES, Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut. G. G. Winberg, V. A. Babitsky, S. I. Gavrilov, G. V. Gladky, and I. S. Zakharenkov. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 383-404.

Descriptors: *Productivity, *Lakes, *Trophic level, *Energy budget, Mesotrophy, Eutrophication, Phytoplankton, Aquatic plants, Bacteria, Zooplankton, Benthic fauna, Benthic flora, Fish, Isotherms, Biological communities, Temperature, Lake morphometry, Solar radiation, Biomass, Photosynthesis, Primary productivity, Chlorophyll, Detritus, Seston, Standing crops, Predation, Biochemical oxygen demand. Identifiers: Lake Naroch (Byelorussia), Lake Bactin (Byelorussia), Lake Mastrof (Byelorussia) torin (Byelorussia), Lake Myastro (Byelorussia), Lake drivyati (Russia).

Productivity by phytoplankton, marcrophytes, bacterioplankton, zooplankton, zoobenthos and fish was investigated in mesotrophic Lake Naroch, highly productive eutrophic Lake Batorin, and intermediate type Lake Myastro, and intermediate type Lake Myastro, Byelorussia, resulting in an approximate biological energy balance for the three different types of lakes. energy balance for the time different types of lakes. In computing total primary production it was assumed that the P/B coefficient of macrophytes was equal to 1.25, and that the expenditure on respiration for all primary producers was 20% of the gross production. Since production was 20% of the gross production. Since production of periphyton was not experimentally determined, it was estimated by taking into account the substrate area suitable for periphyton and lake water optical indices. It was concluded that production of periphyton was close to the production of macrophytes. In mesotrophic Lake Naroch, primary production of phytoplankton was approximately 31% of total primary production, while in Lakes Myastro 87% and in Batorin 96%. Total production by autotrophic organisms in all the lakes was similar. Energy assimilated by autotrophic organisms was 0.30, 0.35, and 0.36% of the total solar radiation. Energy assimilated by bacteria in the vegetative season in Lake Naroch constituted 40% of primary production, in Lakes

Myastro and Batorin, 89 and 74%, respectively. (See also W73-10895) (Jones-Wisconsin) W73-10909

TROPHIC STRUCTURE OF LAKE TATSU-N-UMA, AN ACIDOTROPHIC LAKE IN JAPAN, WITH SPECIAL REFERENCE TO THE IM-PORTANCE OF THE TERRESTRIAL COMMU-

NITY, Yamagata Univ. (Japan). Dept. of Biology.

G. Yamamoto.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 405-419.

Descriptors: "Productivity, "Trophic level, "Acidic water, "Fish population, Benthic fauna, Sessile algae, Insects, Leaves, Fish food organisms, Fish diets, Minnows, Standing crops, Plankton, Benthos, Food chains, Zooplankton, Phytoplankton, Organic matter.

Identifiers: "Lake Tatsu-numa (Japan), Tribolodon, Moroco.

Several lakes in northeastern Japan, originating from volcanic activity, contain strong mineral acid (pH 1.4 to 5.50). Of these, Lake Tatsu-numa was from volcanic activity, contain strong mineral acid (pH 1.4 to 5.50). Of these, Lake Tatsu-num was studied to ascertain mechanisms by which a relatively large fish population is supported in a small area with poor production, and characteristics of biological production of mineral acidotrophic lakes. Only two species of fish, Tribolodon hakonensis hakonensis and Moroco steindachneri steindachneri, inhabit this lake and their production is supported by benthic animals, sessile algae, and terrestrial insects which fall into the water. The fry and juvenile fish depend upon Oedogonium sp., Chydorus sphaericus, and suspended organic particles of the littoral area. Most of the zooplankton are herbivorous and their food was identified as nannoplanktonic algae and organic particles, with the exception of two species of Macrocyclops, which were carnivorous, and a predator-prey relationship was ascertained between Macrocyclops and Chydorus. Production is relatively higher in the littoral area than offshore. The well-developed Phragmites-Salix vegetation, covering 70% of the shore, is the main source of the primary production. The botic community is fairly simple, with three or four terminal consumers in both the littoral and offshore areas supported mainly by terrestrial organisms rather than organisms produced within the lake itself. (See also W73-10895) (Jones-Wisconsin)

PRODUCTIVITY OF AQUATIC ORGANISM COMMUNITIES OF DIFFERENT TROPHIC LEVELS IN KIEV RESERVOIR, Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii. D. Z. Gak, V. V. Gurvich, I. L. Korelyakova, L. E. Kostikova, and N. A. Konstantinova. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 447-455. 1972. 1 tab, 8 ref.

Descriptors: *Productivity, *Biological communi-ties, *Aquatic populations, *Energy budget, *Reservoirs, Eutrophication, Primary productivi-ty, Organic matter, Respiration, Benthic flora, Bacteria, Benthos, Herbivores, Aquatic plants, Zooplankton, Vegetation, Phytoplankton, Benthic fauna, Fish, Algae. Identifiers: *Kiev Reservoir (USSR).

The aquatic communities of three trophic levels in the Kiev Reservoir on the Dnieper River, USSR, were measured, including primary production ophytoplankton, benthic fauna, filamentous algae, and aquatic plants. The difference in input and loss of organic matter was negligible, however, organic matter rich in nitrogen and phosphorus

predominated in the matter leaving the reservoir. The total respiratory energy loss of phytoplankton, bacterioplankton, and zooplankton approaches the value of total respiration. The food requirement of bacterioplankton, herbivorous zooplankton, and non-predatory meso- and macrobenthos, and macrofauna living on macrophytes is almost balanced by primary production. The production of bacterioplankton and of all non-predatory animals may be considered as production of the second trophic level. The production of predatory invertebrates and the residual production of the 2nd trophic level form the reserve of the energy resource utilized by fish, accumulated on the bottom in the form of organic detritus, and to be removed by waterfowl and emerging insects. The fish yield during 1967-1968 provided 0.8 kcal/sq m. If the food coefficient is 10, it is calculated that 8.1 kcal/sq m in the form of fish are utilized by man—less than 1% of the total energy supply of the reservoir. (See also W73-10951 W73-10911

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ENERGY FLOW IN AQUATIC ECOSYSTEMS

ENERGY FLOW IN AQUATIC ECOSYSTEMS IN INDIA, Maharaja Sayajirao Univ. of Baroda (India). Dept. of Biochemistry, and Freshwater Biological Station, Madras (India). S. V. Ganapati, and A. Sreenivasan. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 457-475. 1972. 7 tab, 57 ref.

Descriptors: *Energy budget, *Energy conversion, *Fish harvest, Primary productivity, Solar radiation, Limiting factors, Herbivores, Carp, Photosynthesis, Oxygen, Light intensity, Limnology, Temperature, Nutrients, Respiration, Benthos. Identifiers: *India, Tilapia, Chanos.

Identifiers: *India, Tilapia, Chanos.

An attempt has been made to describe a semi-empirical method of determining the energy availing relationships in production, respiration, and decomposition without the help of highly sophisticated instruments and methods and without resorting to highly complicated mathematical equations and numerous assumptions. Data from results of studies on primary production extending over several seasons of the years 1962 to 1968 and the annual fish production in five typical fish ponds and two man-made lakes have been used in this exploratory paper for a working model in the determination of seasonal variations in the rates of photosynthesis and the energy flow at two trophic levels. The energy fixed from incident solar radiation varied from 1.1 to 10.0% in the smaller, shallower bodies of water and from 0.2 to 0.98% in the two bigger man-made lakes. As these waters were stocked with young of the truly herbivorous species of Indian carps, Tilapia and Chanos, the secondary fish production was from 0.27 to 1.04% of the fixed carbohydrate energy in the smaller bodies and from 0.022 to 0.092% in the bigger man-made lakes. Comparisons are made with certain West German lakes. (See also W73-10895) (Jones-Wisconsin) W73-10912

BIOLOGICAL PRODUCTIVITY OF KURAK-HOV'S POWER STATION COOLING RESER-VOIR. Nauk USSR, Kiev. Instytut

Hidrobiologii. M. L. Pidgaiko, V. G. Grin, L. A. Kititsina, L. G.

In: Program, and M. F. Polivannaya.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 477-491.
1972. 9 tab, 8 ref.

Descriptors: *Productivity, *Energy budget, *Powerplants, *Cooling water, *Reservoirs,

Heated water, Trophic level, Phytoplankton, Beathic flora, Aquatic plants, Bacteria, Zooplank-ton, Biomass, Benthic fauna, Primary productivi-ty, Secondary productivity, Plankton, Benthos, Identifiers: *Kurakhov Power Station (USSR).

A study was conducted of the cooling reservoir of the Kurakhov's Power (electric) Station (USSR) during 1965-1968. It is characterized by specific heat load in summer and by a temperature. me Kuraknov: 8 rower (electric) Station (USSR) during 1965-1968. It is characterized by specific heat load in summer and by a temperature rise of 0.5-3C and satisfies the sanitary standards of the USSR. Species composition and dominating ecosystems are affected principally by geographical location of reservoir, type of water exchange, immological index (ratio of area to mean depth) for slow flow and flowless reservoirs, and annual expenditure of water for flowing reservoirs. Due to the heated discharge, water temperature in the Kurakhov reservoir exceeds the natural by 5 to 6C in winter and 2 to 4C in summer. The study was carried out in three sections: with natural temperature regime, with weak heating, and with great heating. In comparison with the control section of the reservoir with natural temperature regime, chronic overheating of water of 3.2C (average for year) leads to an increase in early primary and to a decrease in secondary production. The minimum water overheating does not cause a change of trophic level, but provides it. (See also W73-10895) (Jones-Wisconsin) W73-10913

BIOLOGICAL PRODUCTIVITY OF THE RYBINSK RESERVOIR, Akademiya Nauk SSR, Moscow. Institut Biologii Vuntrennykh Vod. Y. I. Sorokin.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 493-503. 1972. 4 fig, 1 ab, 19 ref.

Descriptors: *Productivity, *Reservoirs, *Energy budget, Aquatic life, Metabolism, Bacteria, Phytoplankton, Zooplankton, Benthic fauna, Fish, Crustaceans, Benthos, Food chains, Fish harvest, Biomass, Organic matter, Primary productivity. Identifiers: *Rybinsk Reservoir (USSR).

The efficiency of biological productivity and energy flux in the Rybinsk Reservoir (USSR) at all trophic levels in given, including phytoplankton, average number of bacterioplankton, microzooplankton, crustacean zooplankton, the second part of the bacterioplankton are second part of the second par average number of bacterioplankton, benthos, and fish population. The average data for 4 years (1964-1968) are tabulated. The phytoplankton organic matter provides only 25% of food consumed by animals, and the 75% is provided by bacteria; Protozoa and Rottiera give about 70% of total zooplankton production. The benthic fauna uses about 20% of total primary food. Fish larvae form the prevailing part of total fish production and are the basic food source for predatory fish. It is evident that the causes of its relatively low productivity are factors peculiar to a big shallow reservoir of the forest zone. Increase of productivity of the basic area appears impossible. Its main purposes are transport, energy, and shortly, water supply. Only partial solutions are recommended: regulation of the fishery, improvement of conditions for fish reproduction, and construction of pond systems in the shore regions. (See also W73-10895) (Jones-Wisconsin)

ENERGY TRANSFORMATIONS THROUGH PRIMARY PRODUCTIVITY AND FISH PRODUCTION IN SOME TROPICAL FRESH-WATER IMPOUNDMENTS AND PONDS, Freshwater Biological Satation, Madras (India).

A. Sreenivasan.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 505-514.
1972. 3 tab, 40 ref.

Descriptors: "Energy conversion, "Energy budget, "Primary productivity, "Fish harvest, Tropical regions, Reservoirs, Ponds, Productivity, Photosynthesis, Temperature, Solar radiation, Light intensity, Physicochemical properties, Plankton.

Identifiers: India.

Tropical areas with high temperature and bright sunshine are ideally suited for conversion of radiant energy for fish production. In connecting fish production with biological dynamics of ecosystems, six reservoirs and seven ponds and lakes in India were studied because of availability of commercial fishery data. In Bhavanisagar Reservoir conversion to fish was lower due to underexploitation of fish. In Amaravathi Reservoir photosynthetic efficiency as well as fish conversion efficiency were highest among the five impoundments due to algal blooms and their effective utilization by planktonphage fishes. The shallow Odathurai tank ranked even below the deep Amaravathi Reservoir. High utilization of light energy by algae was observed in the three cutrophic ponds, but, as regards fish conversion, the photosynthetically more efficient Ayyankulam pond ranked only next to Fort Moat, Vellore; this may be due to better harvesting and better stocking. There was a glaring contrast among the three upland lakes where a high light conversion efficiency in Ooty Lake and a low efficiency in Kodai Lake reflected the trophic status of the two cold-water, mountain lakes. Yercaud Lake showed a fairly high conversion. (See also W73-10915 W73-10915

BASE FOR A MODEL OF THE SLAPY RESERVOIR ECOSYSTEM,
Ceskoslovenska Akademie Ved, Prague.

Ceskoslovenska Al Hydrobiologicka Lab. M. Straskraba.

M. Straskratos. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 529-540. 1972. 7 fig, 1 tab, 10 ref.

Descriptors: "Systems analysis, "Reservoirs, "Basic data collections, "Methodology, "Productivity, Solar radiation, Ecosystems, Evaporation, Temperature, Dissolved oxygen, Mixing, Phytoplankto."
Identifiers: "Slapy Reservoir (Czechoslovakia), Energy flow diagram, Annual cycles.

Energy flow diagram, Annual cycles.

Two basic approaches dominate the present limnological work: the direct observations of aquatic ecosystems under different climatic conditions and effects of man, and an experimental laboratory analysis of interactions of selected factors and biota. A third approach is represented by natural experiments, in which the complexity of the interrelations is retained, and reaction on changing one or more variables is studied, thereby conclusive results concerning the effect of the changed variables can be achieved under favorable conditions. The third group models, 'precise models,' closest to field limnologists' thinking, represent the obvious next step of evaluation with quantitative data. A mathematical expression of the empirical deterministic relations between variables proves useful for predicting water conditions. Studies of Slapy Reservoir thermics show it as a dynamic system sensitive to changing discharges and inflow temperatures. The method is applied to the whole ecosystem. It is evident that a distinction of the extreme values is a useful tool for studying the character of the dominant interrelations. In combination with approximation of the curves by harmonic analysis, prediction of the annual course during different conditions is obtained. Character and explanation of relations found represents a basis for modeling the Slapy Reservoir ecosystem. (See also W73-10895) (Jones-Wisconsin)

RESULTS OF THE STUDY OF SOME LINKS OF THE FOOD CHAIN IN A CARP POND IN

THE FOOD CHAIN IN A CARP POND IN CZECHOSLOVAKIA, Karlova Universita, Prague (Czechoslovakia). Dept. of Hydrobiology. V. Korinek.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 62, 1970, Kazimierz Dolny, Poland, p 541-553. 1972. 5 fig, 10 tab, 24 ref.

Descriptors: *Productivity, *Food chains, *Ponds, *Energy transfer, *Trophic level, Carp, Nitrogen, Seston, Density, Standing crops, Phytoplankton, Zooplankton, Fish harvest, Organic matter. Identifiers: *Czechoslovakia.

Identifiers: *Czechoslovakia.

Results are given of the production study carried out on the carp pond Smyslov (southern Bohemia, Czechoslovakia) during the years 1965 to 1967. The standing crop of the bottom fauna and the zooplankton as well se the amount of nutrients have been measured since 1955 in this pond. Basic characteristics of the water-phytoplankton zooplankton, fish, and comparison of trophic levels-are discussed. Content of Kjeldahl nitrogen in water and seston was measured. Density, standing crop and gross production of phytoplankton and zooplankton were measured and related to fish yield. Testing the distribution of measured values of the gross phytoplankton production, the hypothesis of the log-normal distribution cannot be refuted and yearly geometrical means were calculated. The most important group of the zooplankton from the production aspect in the pond were Cladocera. The changes in their density are shown. The dominant species were Daphnia pulicaria and Daphnia hyalina. The net efficiency of the energy transfer from phytoplankton to Daphnia was in the range from 9 to 52% and that from phytoplankton to fish between 2 and 13%. The efficiency values are also discussed. (See also W73-10895) (Jones-Wisconsin)

SOME OBSERVATIONS ON PRIMARY AND FISH PRODUCTION IN EXPERIMENTAL FISH PONDS IN MALACCA, MALAYSIA, Fish Culture Research Training Inst., Malacca

Pish Culture Research Training Inst., Malacca (Malaysia).
G.A. Prowse.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Doiny, Poland, p 555-561.
1972. 4 tab, 3 ref.

Descriptors: *Productivity, *Primary productivi-ty, *Energy conversion, *Ponds, Fish stocking, Fish harvest, Photosynthesis, Fertilization, Solar Identifiers: *Malacca (Malaysia), Autoshading.

Five ponds used for experimental stocking were studied and primary production measurements conducted at four weekly intervals. The ponds were stocked mainly with Tilapia, and algal feeder, with fewer grass carp, Ctenopharyagodon idellus and Puntius gonionotus. For estimating the fish production, the ponds were completely fished and drained and the increment of weight taken as the measure of productivity. Calculations of photosynthetic efficiencies ranged from 7.04 to 3.98%. Calculations of energy conversion from orimary to fish production gave efficiencies of 3.98%. Calculations of energy conversion from primary to fish production gave efficiencies of 1.02 to 1.79%. High protein pelleted foods give a conversion efficiency of 6%. The conversion efficiencies of 1.02 to 1.79% may seem low, but even the best of protein pelleted foods only give a conversion efficiency of about 6% when calculated as energy. The depth-productivity profiles show clearly the effect of autoshading and the rapid productivity decrease in the highly eutrophic conditions. Clearly autoshading and the high respiration of the phytoplankton must set an upper limit to the potential fish productivity under eutrophic conditions, and this has been found to be so in practice. (See also W73-10895) (Jones-Wisconsin) W73-10918

Group 5C-Effects of Pollution

INTENSIFICATION OF FISH PONDS PRODUC-

TION, Instytut Rybactwa Srodladowego, Zabieniec (Po-land). Dept. of Fish Culture. P. Wolny, and E. Grygierek. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 563-571. 1972. 8 fig, 4 tab, 4 ref.

Descriptors: "Primary productivity, "Fish harvest, "Fish food organisms, "Productivity, Fertilization, Trophic level, Temperature, Phytoplankton, Zooplankton, Benthic fauna, Carp, Biomass, Photosynthesis. Identifiers: Phytophagous fish.

Fish production depends on the total productivity, thus observations were made on variations in the qualitative occurrence of organisms from different trophic levels, under various environmental conditions (different fertilization, different stock density, carp monoculture, polyculture, and hytophagous fish). The investigations were conducted at the Department of Fish Culture, Zabieniec, Poland; ponds were stocked with fish larvae. A clear positive correlation between temperature and fish growth was found. Mineral fertilization, increase of stock density, and introduction of phytophagous fish are important factors in intensifying fish production; when these were applied great increases of primary as well as secondary production were observed. The coefficient of correlation between primary production and fish production was estimated to be 0.98. Good results were obtained with double stock density of common carp but the best were in ponds with polyculture of common carp and phytophagous fish. The percentage relation between zooplankton and phytoplankton was inverse; no correlation was observed between fish and zooplankton. Although tions (different fertilization, different stock densiserved between fish and zooplankton. Although served between fish and zooplankton. Although fish production in ponds with phytophagous fish was greater, the ecological efficiency of production uptake by fish was no greater; introduction of these fish is profitable not for an increase of ecological efficiency but for the general increase of pond productivity. (See also W73-10895) (Auen-Wiccourt)

PRODUCTIVITY AND ENERGY FLOW AT ALL TROPHIC LEVELS IN THE RIVER THAMES,

Beford Inst., Dartmouth (Nova Scotia). Marine

Betoff Hash, Ecology Lab.

Ecology Lab.

K. H. Mann, R. H. Britton, A. Kowalczewski, T. J.

Lack, and C. P. Mathews.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 579-596.

1972. 3 fig, 5 tab, 29 ref.

Descriptors: *Productivity, *Energy conversion, *Trophic level, *Energy budget, Photosynthesis, Respiration, Fish populations, Crustaceans, Respiration, "in populations, Civiataceans, Rotifers, Detritus, Insects, Decomposing organic matter, Physical properties, Algae, Phytoplankton, Oxygen, Aquatic plants, Leaves, Benthic fauna, Primary production, Fish food organisms, Fry, Plankton, Energy transfer.

Identifiers: "River Thames (England), River Kendentifiers: "River Thames (Engla

net (England).

populations, measurements, algal rhysical measurements, agai populations, phytoplankton biomass, oxygen consumption, planktonic primary production, production by benthic animals, fish populations, estimation of the partitioning of the energy uptake of roach and bleak, and decomposition are given for the Thames River. Productivity and energy flow have been studied at all trop levels in the river, a lowland river engineered for navigation and carrying considerable quantities of treated sewage effluent. The most abundant fish were roach (Rutilus rutilus) and bleak (Alburnus alburnus). Figures given for net production represent total photosynthesis less the respiration of the plants and the respiration of the heterotrophs, particularly bacteria and represent a net gain of calories to the community during a 24-hour period. The figures from direct estimates of production by browsers and grazers below the Kennet River mouth are almost exactly those ob-tained by back-calculation from the food requireamed by back-calculation from the food requirements of fish. The very high population densities and production rates of young fish have only recently been determined and greatly modify earlier estimates of total fish production. (See also W73-10895) (Jones-Wisconsin)

THE CHALK-STREAM ECOSYSTEM,

Freshwater Biological Association, Wareham (England). River Lab.
D. F. Westlake, H. Casey, H. Dawson, M. Ladle, and R. H. K. Mann.

and K. H. K. Mann. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 615-635, 1972. 5 fig, 4 tab, 40 ref.

*Productivity, *Streams. Descriptors: **Ecosystems, *Calcareous soils, *Primary production, Physicochemical properties, Energy budget, Biomass, Organic matter, Aquatic plants, budget, Biomass, Organic matter, Aquatic piants, Algae, Invertebrates, Fish populations, Detritus, Suspended load, Solar radiation, Leaves, Tem-perature, Predation, Respiration. Identifiers: *Chalk-streams, Southern England, River Frome (England), Bere Stream (England), Self-shading.

The typical chalk-stream results from a particular combination of geology, plant and animal species and human management found in Southern En-gland. Research on a range of chalk-streams, espegland. Research on a range of chalk-streams, espe-cially a stretch of the Bere Stream and the larger River Frome, details the physical and biotic fac-tors affecting production. Accounts are given of the composition, biomass, and production of the communities of higher plants, algae, invertebrates and fish, and of the throughput and deposition of fine detritus. Available data on the biomass and acceleration of the accommunities at Ress Heath are production of the communities at Bere Heath are production of the communities at Bere Heath are summarized. The most striking feature is the vast quantity of energy present in the form of detritus, which approaches the magnitude of the useful solar energy input and is probably more than an order of magnitude larger than the invertebrate food requirements. The main uncertainties in the food requirements. The main uncertainties in the estimates of primary production are algal produc-tion, the P/B ratio for emergent plants and the al-lowances made for the biomass in reaches not stu-died. Since most of the chemicals in solution show title seasonal variation, and appear to exceed the requirements of the communities, the major factors controlling production are physical and biotic. (See also W73-10895) (Jones-Wisconsin) W73-10921

PHYTOPLANKTON PRODUCTION, CHEMI-CAL AND PHYSICAL CONDITIONS IN LOCH LEVEN.

Nature Conservancy, Edinburgh (Scotland); and Freshwater Fisheries Lab., Pitlochry (Scotland). Nature Co M. E. Bindloss, A. V. Holden, A. E. Bailey-Watts, and I. R. Smith.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 639-659, 1972. 6 fig, 5 tab, 19 ref.

Descriptors: *Phytoplankton, *Productivity, *Chemical properties, *Physical properties, Temperature, Circulation, Solar radiation, Energy budget, Nitrogen, Phosphorus, Algae, Photosynthesis, Primary production, Benthic flora, Diatoms, Plankton, Water balance, Energy balance, Chlorophyll, Nutrients, Silicates, Respiration. Identifiers: *Loch Leven (Scotland), Self-shading.

Throughout the year Loch Leven (Scotland) shows large crops of planktonic algae which are considered the main contribution to the lake's primary production. Although macrophytes are sparse, considerable quantities of benthic algae, mainly diatoms, but including some blue-green and flagellate algae, develop as attached and motile communities in this shallow water. Studies on species composition, seasonal succession and spatial distribution of the benthic algae are being started. Loch temperature, water balance, loch circulation, radiation and energy balance are described. Chemical studies have concentrated on the input and loss of nitrogen and phosphorus through the loch. More than 200 planktonic algal species are recorded. Predominance of 'anno' algae and small cells of other species is an interesting general feature, associated with apparent absence of filterfeeding herbivorous crustaceans, although other algal-feeding plankters are often abundant. The complexity of the chlorophyll—a increase during the first half of the year is seen when the succession of the statement of the succession of the succession of the statement of the succession of the statement of the succession of the Throughout the year Loch Leven (Scotland) complexity of the chlorophyll-a increase during the first half of the year is seen when the succes-sion of constitutuent algal species is considered. The self-shading effect tends to stabilize euphotic oppulations below one square meter and to oppose somewhat expected increase in productivity with increasing standing crop. (See also W73-10895) (Jones-Wisconsin) W73-10895) W73-10922

PRIMARY PRODUCTION OF A MONTANE

RIVER,
Polish Academy of Sciences, Krakow. Zaklad
Biologii Wod.

Biologii Wod.

M. Bombowna.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 661-671, 1972. 8 fig, 7 tab, 8 ref.

Descriptors: "Testing procedure, "Primary productivity, "Mountains, "Rivers, Oxygen, Algae, Chlorophyll, Conductivity, Photosynthesis, Temperature, River flow, Diatoms, Solar radiation, Water level fluctuations, Energy conversion. Identifiers: "Attached algae, "Montane river, River Raba (Poland).

The primary production of the Polish montane River Raba was measured using several techniques. Results of primary production measurements of attached aligae and seston by the C-14 method at very low water levels are given. Measurements of oxygen fluctuations in 24-hour cycles were made at varying water levels and varying rapidity of water currents. Air and water temperature and electric conductivity were measured simultaneously. Primary production is in inverse ratio to water level and discharge volume. Succession of predominant microphytes in different seasons affects primary production aliferent seasons affects primary production different seasons affects primary production of attached algae dependes considerably on growth of dependence is often obliterated by water level fluctuations. The amount of primary production of attached algae depends considerably on growth of communities on stones and it fluctuates throughout the river, being higher in the upper section's stony bottoms than in the lower section's sandy bottom. Chlorophyll content is a good index of productivity of a river of this type. Primary production estimates in rapid currents cannot be made by measuring the oxygen content. The method of artificial substrata fixed periodically proved most useful for investigations on the flucproved most useful for investigations on the fluctuations of primary production of attached algae. (See also W73-10895) (Jones-Wisconsin) W73-10923

OBSERVATIONS ON PRIMARY PRODUCTION OF PHYTOPLANKTON IN TWO FISH PONDS, Karlova Universita, Prague (Czechoslovakia). Dept. of Hydrobiology. J. Fott.

rott.
 In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 673-683, 1972. 7 fig, 2 tab, 14 ref.

Descriptors: "Ponds, "Primary productivity,
"Phytoplankton, "Fish farming, Algae, Oxygen,
Respiration, Carp, Chlorophyll, Light penetration,
Photometry, Photosynthesis, Light intensity.
Identifiers: "Carp ponds, Czechoslovakia."

Identifiers: *Carp ponds, Czechoslovakia.

Meausrement of primary production of phytoplankton in two Czechoslovakian carp ponds were carried out from spring to autumn and the data analyzed from two standpoints: comparison of data obtained by the oxygen and C-14 methods and comparison of primary production and respiration of the plankton. Ratio of the net oxygen production to the assimilated carbon was 0.9: 1.2 in the upper part of the photic zone. In studies comparing oxygen production in algae with carbon uptake determined by C-14 technique, corrections by arbitrary photosynthetic quotients were avoided. Comparison of the methods is expressed as quotients which are calculated from the values actually measured; the compared methods were in mutual agreement. When phytoplankton was about 10% of maximum gross production (values per unit volume compared). Net production of planktonic algae per 24 hours per unit surface area was estimated as 55% to 80% of gross production in a small shallow pond. The percentage was stable during three months of a phytoplankton bloom. (See also W73-10895) (Jones-Wisconsin)

PHOTOSYNTHETIC PRODUCTIVITY IN THE AJWA RESERVOIR AT BARODA, WEST INDIA, Maharaja Sayajirao Univ. of Baroda (India). Dept. of Biochemistry.
S. V. Ganapati, and C. H. Pathak.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 685-692, 1972. 7 tab, 7 ref.

Descriptors: "Photosynthesis, "Productivity, "Reservoirs, Thermal stratification, Energy con-version, Oxygen, Respiration, Physicochemical properties, Dissolved oxygen, Solar radiation, Aquatic plants. Identifiers: "Ajwa Reservoir (India), "Baroda (West India).

(West India).

Study of the limnological productivity in the Ajwa Reservoir near Baroda (West India) was conducted in 1963 and 1964. A survey of physicochemical, bacteriological and biological conditions of surface water was undertaken once a month. There was no permanent thermal stratification for any period but it was diurnal in character. In 1963, gross oxygen production varied between 0.42 and 7.64 g/sq m/day and in 1964 between 0.45 and 1.57 g/sq m/day, the annual averages being 3.36 and 0.84 g/sq m/day, respectively. Net oxygen production was found to vary between 0 and 2.06 g oxygen/sq m/day in 1963 and between 0.01 and 0.44 g oxygen/sq m/day in 1964. The annual average ratio of 24-hour respiration to gross production was found to be 79.2% in 1963 and 6.6% in 1964. The annual average photosynthetic efficiency was 0.63% in 1963 and 0.18% in 1964. These values are compared with those of a few temperate and tropical waters. (See also W73-1095) (Jones-Wisconsin)

THE REGULATION OF NET PRIMARY PRODUCTION IN LAKE GEORGE, UGANDA, EAST AFRICA, Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).
G. G. Ganf.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 693-708, 1972. 9 fig, 3 tab, 12 ref.

Descriptors: "Primary productivity, "Energy conversion, Phytoplankton, Photosynthesis, Respiration, Tropical regions, Biological communities, Bicarbonates, Ions, Oxygen, Growth rates, Nutrients, Light penetration, Cyanophyta, Diatoms, Chlorophyla, Chlorophyla, Solar radiation, Stratification, Temperature.

Identifiers: "Lake George (Uganda), Self-shading.

Identifiers: *Lake George (Uganda), Self-shading. Phytoplankton is the major source of primary production through direct conversion of solar to chemical energy during photosynthesis in Lake George, western Uganda. The gross photosynthetic rates are high, while net production is relatively low, because most carbon fixed is rapidly recycled via the respiratory cycle. The factors which govern respiratory rates and photosynthetic rates are, therefore, those which regulate net production. The major ecological factors governing photosynthetic rates are light, temperature, and the nutrient balance of the ecosystem. As the light and temperature characteristics of Lake George show little seasonal fluctuation, it may be assumed that they have a fairly constant effect upon the phytoplankton community. Therefore, changes in community density may be attributed to fluctuations in nutrient status or to variations in efficiency of the photosynthetic system. Given a relatively stable environment, the factors which tend to minimize change in the community become important. These factors are manifold but the self-regulation and low magnitude of the net production allows this algal community to maintain itself without radically changing the ecological template or over-exploiting the available nutrients. In this way, the violent populations fluctuations, common in temperate waters, are avoided. (See also W73-10895) (Jones-Wisconsin)

COMPARATIVE TRENDS OF PRIMARY PRODUCTIVITY AND SOME CHEMICAL PARAMETERS IN LAKE MAGGIORE ON A PLURIANNUAL BASIS, Istituto Italino di Idrobiologia, Pallanza (Italy). M. Gerletti.

M. Gerletti.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 709-713, 1972. 3 fig, 13 ref.

Descriptors: *Primary productivity, *Water chemistry, Trophic level, Energy conversion, Solar radiation, Photosynthesis, Nutrients, Eutrophication, Conductivity, Phosphorus. Conductivity, Nitrates, Identifiers: *Lake Maggiore (Italy).

Annual primary production is computed for Lake Maggiore using 14 series presented by Vollenweider (195-60) and 14 series by Goldman, et al. (1965), all obtained by the C-14 method, using a mean photosynthetic efficiency computed for cach group and records of solar radiation of the meteorological observatory. The increase of production is supported by examination of depth profiles of production from surface to 30 meters obtained in Lake Maggiore in successive years. Data show a quite steady increase in during the last eleven years. Increase in nutrients must be attributed to human domestic pollution mainly and to a limited amount of industrial pollution. The increased, unevenly distributed human population implies a faster and more complete flow of nutrients into lake waters through the numicipal sewage systems, hitherto not equipped with treatment plants. The most probable source of phosphorus increase is the recent introduction of synthetic detergents. Other observations support a trend towards a situation of 'cultural' eutrophication. In the last ten years recurrently dense Tabelaria populations sometimes reached the bloom stage. In autumn 1967 for the first time Ocillatoria rubescens produced a bloom. (See also W73-10895) (Jones-Wisconsin)

W73-10927

THE PRIMARY PRODUCTIVITY OF A FISH-POND AT ILE-IFE, NIGERIA, Ife Univ. (Nigeria). Dept. of Biological Sciences; and Eotvos Lorand Univ., Budapest (Hungary). Chair of Plant Physiology.
A. M. Imevbore, G. Meszes, and Z. Boszormenyi.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problesm of Freshwaters, May 6-12, 1970. Kazimierz. Dolny, Poland, p 715-723, 1972. 4 fig, 3 tab, 7 ref.

Descriptors: "Primary productivity, "Fish farming, "Ponds, Phytoplankton, Nutrients, Algae, Photosynthesis, Physical properties, Meteorological data, Tropical regions, Chemical properties, Seasonal, Light penetration, Energy conversion, Biomass, Light intensity, Limiting factors. Identifiers: "Be-Ife (Nigeria), Kainji Lake (Nigeria), Fish pond.

(Nigeria), Fish pond.

Algal photosynthetic activity and productivity studies of West African fresh waters using the Cl-4 technique were undertaken in a small fish-pond, while parallel observations were conducted in the Kainji Reservoir. Meteorological data for the area are given. Data obtained for photosynthetic production under natural conditions reflect the combined action of changes in intensity of underwater light penetration and changes in the quantity (activity) of phytoplankton. The low production value obtained in the field in June was not caused by low plankton quantity and activity but rather by low light intensity. High production values between February and June in both natural and artificial conditions were due to both high plankton activity and favorable light. In corollary, generally lower production values during the July-December months, even under artificial illumination, must be attributed to lower plankton activity. Higher production values in the afternoon than in the morning indicate both a circadian rhythm in the phytoplankton and a generally stronger light intensity in the afternoon. In summary, it seems that nutrients limit primary productivity most of the year, but, occasionally light penetration is also limiting. These data are in the range found by Talling (1965) for productivity of East African lakes. (See also W73-10895) (Jones-Wisconsin)

COMPARISON OF SOME METHODS OF DETERMINING THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN PONDS, Polish Academy of Sciences, Krakow. Zaklad Biologii Wod. S. Wrobel.

S. Wrobel.
In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 733-737, 1972. 3 fig, 2 tab, 5 ref.

Descriptors: "Testing procedures, "Primary productivity, "Phytoplankton, "Ponds, Analytical techniques, Chlorophyll, Productivity, Gas chro-matography, Eutrophication, Measurement. Identifiers: Golysz (Poland), Oxygen exchange method, Oxygen method, C-14 method.

Measurement of the primary production of phytoplankton in ponds at Experimental Fishery Farms, Golysz, Poland, were made by several methods. The light and dark bottle method was compared with the C-14 method and with the method of oxygen exchange between water and air. In the two experimental ponds the Cyanophyceae species pervailed with a predominance of Microcystis aeruginosa, while in another pond Volvox aureus prevailed. The small number of experiments does not permit drawing any detailed conclusions. It is certain, however, that the value of total production calculated by the oxygen method in eutrophic waters is 15-20% lower than in actuality; for the value of net production the difference would probably be twice

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Group 5C-Effects of Pollution

as great. However, comparing these methods, very similar results of the total production measured by the oxygen method and the C-14 method as well as of the net production estimated by the oxygen method and the gas exchange method are obtained. In highly eutrophic water basins the use of oxygen method is limited. It is concluded that in waters belonging to the extreme types, primary production may be measured only by the C-14 method. (See also W73-10895) (Jones-Wisconsin) W73-10929

THE EXTENT OF CONSUMPTION OF THE ENERGY CONTAINED IN THE FOOD SUSPENSION OF CERIODAPHNIA RETICULATA (JU-

Bailystok Medical Academy (Poland). Dept. of ogy.

B. Czeczuga, and E. Bobiatynska-Ksok. In: Proceedings of the IBP-UNESCO Symp on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 739-748, 1972. 5 fig, 2 tab, 36 ref.

Descriptors: *Productivity, *Energy conversion, *Nutrient requirements, *Crustaceans, Energy transfer, Respiration, Food chains, Metabolism, Animal growth, Reproduction, Algae. Identifiers: *Ceriodaphnia reticulata, Energy assimilation.

The importance of determining the energy metabolism of Ceriodaphnia is based on its importance as food in the early stages of fry develop-ment of various fish species. The number of the algal cells consumed was calculated from the differences in suspension concentrations. The algae used were Chlamydomonas nivalis, Chlorella elipsoidea, Chlorella vulgaris, Ankistrodesmus falsoidea, Chlorella vulgars, Ankistrodesmis fai-catus var. duplex, and Scenedesmus obliquus. C. reticulata specimens were divided into three groups: small, medium, and large, mature. Twenty small, 10 middle-sized and 10 large specimens were placed in 20 ml of suspension. Number of cells consumed was calculated from the dif-ferences in the suspension concentrations by means of a Burker camera. The caloric value of the various alsel species and in the size groups of the various algal species and in the size groups of C. reticulata was determined by means of a calorimetric microbomb. Respiration intensity was determined by Warburg apparatus. Ratio of number of calories taken in with food, burnt during respiration, assimilated with food, to number of calories contained in the food suspension, perent of consumption of reserves in food suspension and coefficient K-1 and K-2 for each growth group of C. reticulata fed with different algal species were recorded. (See also W73-10895) (Jones-W73-10930

COMPARISON OF THE PHYSICAL AND CHEMCIAL ENVIRONMENTS OF VOLTA LAKE AND LAKE NASSER,

Lake Nasser Development Centre, Aswan (Egypt). B. Entz.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 883-891, 1972. 1 fig, 6 tab, 2 ref.

Descriptors: *Lakes, *Physical properties, *Chemical properties, *Africa, Eutrophication, Oligotrophy, Turbidity, Tropical regions, Productivity, Phytoplankton, Oxygen, Hydrogen ion concentration, Nutrients, Temperature, Winds, Botton sediments tom sediments

Identifiers: *Volta Lake (Africa), *Lake Nasser

Comparison is made of some limnological condi-tions in two recently created African lakes: Volta Lake, oligotrophic, is entirely within the tropics, while Lake Nasser, eutrophic, has tropical and

subtropical sections. In Volta Lake, Microcystis water-blooms developed shortly after the floods; in Lake Nasser a strong 'water coloration' appeared in the second half of the flood season, caused mainly by Volvox. The level of oxygen saturation in Volta Lake is mainly influenced by saturation in Volta Lake is mainly influenced by the wind. The bottom is covered with decompos-ing trees, bushes, grass, or soil with high organic matter content, and there is a still continuing ox-ygen reduction taking place in the water mass. Ox-ygenation through the surface is the main source of dissolved crusen. In Jake Nasse, the oxygen ygenation through the surface is the main source of dissolved oxygen. In Lake Nasser the oxygen situation is quite different: during winter and spring months oxygen concentrations near the surface were as high as 110-160% of the saturation level caused by a high photosynthetic rate. Wind it a much more important temperature regulating factor than it is on Volta Lake. The richness of Lake Nasser, a cause of intensive photosynthesis, is responsible for pH levels which are much higher than thos in Volta Lake. (See also W73-10895) W73-10931

SOME CHARACTERISTICS OF A SHALLOW ENDORHEIC LAKE IN ITS DRYING PHASE AND ITS REVOVERY PHASE, LAKE CHILWA (MALAWI), Malawi Univ., Limbe.

N. P. Mwanza.

In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 897-900, 1972. 6 ref.

Descriptors: *Lakes, *Shallow water, *Dry beds, Tropical regions, Saline water, Biological communities, Conductivity, Phytoplankton, Zooplankton, Fish, Alkalinity, Algae, Bacteria, Invertebrates. Identifiers: *Lake Chilwa (Malawi).

Lake Chilwa, Malawi, Africa, is a shallow tropical lake which undergoes drying and flood conditions. During dry years, life all but disappears, but dur-ing recovery biological communities reappear. This is summarized in context of the salinity changes. The changing salt content seems to be due only to dilution and evaporation. Quantitative studies of bacterial populations during the drying phase show lower counts when salimity and alphase show lower counts when saltany and air-kalinity have risen, and higher counts during recovery. Algal studies during the two phases show considerable changes in abundance and type. During the drying phase the flora consists of only a few species of Cyanophyta and diatoms. The recovery phase was characterized by the development of a more diverse flora with many algae of Chlorophyta and Chrysophyta species. The Chlorophyta include many Volvocales which cover the water surface with a more or less continuous green sheet. During the drying phase ob-servations of zooplankton abundance and breed-ing were noted, while in the recovery phase intensive studies of horizontal distribution of species in open water, bay and marshes and of quantitative open water, bay and marsnes and of quantitative composition, periodicity, and cyclomorphosis are being made. There are three species of commer-cially important fish. During recovery phase a pro-gram of restocking with the endemic Tilapia spe-cies was initiated. (See also W73-10895) (Jones-Wisconsin) W73-10932

ON THE QUALITATIVE CHARACTERISTICS OF THE PHYTOPLANKTON OF THE NATRON ('SZIK') PONDS OF HUNGARY, Damjanich Muzeum, Szolnok (Hungary). Labora-

torium Tisza-Forsch.

G. Uherkovich. In: Proceedings of the IBP-UNESCO Symposium on Productivity Problems of Freshwaters, May 6-12, 1970, Kazimierz Dolny, Poland, p 913-918, 1972. 3 fig. 9 ref.

Descriptors: "Phytoplankton, "Ponds, Saline water, Cyanophyta, Indicators, Diatoms, Carbonates, Bicarbonates, Hydrogen ion concentration, Biological communities, Scenedesmus, Water chemistry. Identifiers: "Natron ponds, "Hungary.

In contrast to salt lakes characterized by their considerable sodium chloride concentrations, lakes with higher concentrations of sodium carbonate and sodium bicarbonate natron lakes are comparatively rare. A number of natron ponds are present in the region between the rivers Danube and Tisza (Hungary) in deflated depressions and also east of the River Tisza in dried-out riverbeds. Quantitative composition of the cenoses is a more revealing indicator of their salt water character than mere qualitative description, as they are composed of 55.5% salt water on the average. The great varia-55.5% salt water on the average. The great variation of phytoplankton cenoses is shown in the profound changes which may occur in a very short time. Cenoses of phytoplankton with the largest populations are invariably composed of representatives of salt water organisms in proportions greater than 90%. The most numerous cenoses are usually caused by the multiplication of one or two Cyanophyta organisms (like Dactylococcopsis rupestris, Phormidium fragile, Gomphosphaeria aponina, Lyngbya limnetica). Presence of certain salinity-indicator organisms of the Bacillariophyceae species is usually typical of these cenoses. (See also W73-10895) (Jones-Wisconsin) W73-10931 W73-10933

THE BOTTOM FAUNA IN AN OIL-CO-

THE BOTTOM FAUNA IN AN OIL-CO-NTAMINATED LAKE, Lund Univ. (Sweden). Limnological Inst. L. Bengtsson, and H. Berggren. Ambio, Vol 1, No 4, p 141-144, 1972. 3 fig, 2 tab,

Descriptors: *Benthic fauna, *Lakes, *Oil pollution, Water pollution effects, Bottom sediments, Biological communities, Urban runoff, Sampling, Rehabilitation, Hypolimnion, Aeration, Spectrophotometry, Oligochaetes, Diptera, Tubificids,

Identifiers: *Lake restoration, Jarla Lake (Sweden), Industrial runoff.

Results of analyses of bottom sedi from Jarla Lake, Sweden, showed that the oil content increases towards the bay where the main runoff water outlets are situated. Lack of macrobenthos at lower depths and improverished bottom fauna indicate a very strong influence of the oil and oil derivatives in the waste water runoff. The oil content of sediment can affect the organisms mechanically and physiologically and may also be toxic. Normally macrobenthos consume fresh settled material, older sediment material, build tubes in the sediment and pump oxygen-rich water through these, aerate the sediment surface water through movement, move sediment-which is altered during passage through the in-testinal cannal-from beneath to the sediment sur-face and make it available for aerobic microbial decomposition. Their fish predators mix the sur-face of the sediment in attempting to catch them. Studies have been concentrated on different methods of reducing oil content in waste water and on the effects of oil on the efficiency of sewage plants. Large quantities of oil enter receiving water with runoff water which originates from filling stations, industrial areas and roads. (Jones-Wisconsin) W73-10934

ECOSYSTEM STUDIES IN CONNECTION WITH THE RESTORATION OF LAKES, Lund Univ. (Sweden). Limnological Inst

.. Bengtsson. Verhandlungen der Internationalen Vereiningun fur Theoretische und Angewandte Limnologie Vol 18, p 379-387, 1972. 7 fig, 2 tab, 6 ref. Descriptors: "Ecosystems, "Lakes, "Rehabilita-tion, "Water pollution treatment, Eutrophication, Projects, Biological communities, Aquatic plants, Sediments, Water levels. Identifiers: "Lake restoration, Lake Trummen (Sweden), Lake Hornborga (Sweden).

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The lake restoration research program at the University of Lund, Sweden, is an interdisciplinary ecological as well as an ecological-technical collaboration to study principles for solution of severe environmental problems caused by man, restoration of some especially valuable lakes, to train ecologists for solving problems in applied water management, and to gain knowledge in theoretical ecology. The two lakes considered were Trummen and Horborga; results are presented. In Lake Trummen, by means of a suction dredger 1 m sediment is pumped from the lake onto the land, 0.5 m in 1970 and another 0.5 in 1971. Alttogether 600,000 cu m gyttja and 300,000 cu m lake water were pumped to settling ponds. From these the mixture of lake and interstitial runoff water is treated with aluminum sulphate before returning to lake Trummen. Through the restoration the water volume increases about 70%. Lake Hornborga, which had been unsuccessfully lowered to gain arable land, had been considered an important Western Eutropean waterfowl refuge. In considering the raising of the water level for restoration, the accumulated masses of coarse Phragmites detrius had to be reduced and primary production redistributed. Although the projects had not been completed. improvements are production redistributed. Although the projects had not been completed, improvements are evident. (Jones-Wisconsin) W73-10935

THE GENETICS OF BLUE-GREEN ALGAE, University Coll., Galway (Ireland). Dept. of Microbiology. J. A. Houghton.

Science Progress, Oxford, Vol 60, No 239, p 407-412, 1972. 51 ref.

Descriptors: *Genetics, *Cyanophyta, *Algae, Phyllogeny, Cytological studies, Metabolism, Reproduction, Reviews.

The phyllogenetic position of blue-green algae is still speculative and a comparison of the gentic system of blue-green algae and those of bacteria and other algae might provide very useful informa-tion, especially for their economic exploitation. An attempt is made to clarify present knowledge An attempt is made to clarify present knowledge of their genetics. Until recently, blue-green algae were regarded as reproducing primarily by binary fission. Much of the genetic work published to date has been concerned with induction of mutants, recombination studies, and genetic mapping. Bazin showed quite conclusively that genetic recombination could occur in Anacystis nidulans. The results indicated that genetic transfer followed by recombination was taking place between two strains, providing clear evidence for sexuality. lowed by recombination was taking place between two strains, providing clear evidence for sexuality, and thus making genetic mapping more feasible. Some spontaneous mutants, for example mutants of the strain saffecting cell division, have been isolated but most recent techniques have involved use of chemical mutagens. Ultraviolent light has also been used in the isolation of mutants from Anabaena doliolum and A. cycadeae. A temporal expertic man of six cistron has been prepared. genetic map of six cistron has been prepared.

Other approaches to genetic mapping are the use
of genetic transformation and use of transduction; of genetic transformation and use of transduction; blue-green algal viruses have been isolated which make the latter technique feasible. (Jones-Wiscon-W73-10938

RELEASE OF AMMONIUM-N FROM SEDI-MENTS TO WATERS, Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W73-10939

COMPLEXING PROPERTIES OF NITRILOTRIACETIC ACID IN THE LAKE ENVIRONMENT, Department of Energy, Mines and Resources, Burtington (Ontario). Canada Center for Inland

Y. K. Chau, and M. T. Shiomi. Water Air Soil Pollut. Vol 1, No 2, p 149-164, 1972.

Identifiers: Acetic-Acid, Cadmium, Copper, Environment, Lakes, Mercury, Nickel, *Nitrilotriacetic acid.

Recent proposals to limit the phosphate content of detergents have prompted the detergent industry to investigate possible phosphate substitutes. The trisodium salt of nitrilotriacetic acid (NTA) was one of the most promising compounds proposed. At concentrations above 1 ppm NTA can react with sparingly soluble compounds to release the metal and associated anions through complexation. It also interacts with sediment to release certain metals depending on the abundance of the metals in the sediment. In situ and laboratory experiments were carried out to study such interactions and also to follow the fate of these released metals after NTA has degraded. Degradation of metals after NTA has degraded. Degradation of certain NTA-metal complexes in lake water medi-um was also studied. Certain NTA complexes (Cu, Ni, Cd, Hg) were very resistant to degradation. Copyright 1972, Biological Abstracts, Inc. W73-10942

THE EFFECT OF NUTRIENT FERTILIZATION ON THE BENTHIC ALGA ULVA LACTUCA, Harvard Univ., Cambridge, Mass. Lab. of Applied

Microbiology. T. Waite, and R. Mitchell. Botanica Marina, Vol 15, No 3, p 151-156, 1972. 4

Descriptors: *Productivity, *Estuaries, *Fertiliza-tion, *Benthic flora, Marine algae, Nutrients, Biomass, Plant growth, Massachusetts, Ammonia, Phosphates, Carbon fixation, Photosynthesis, En-zymes, Nitrogen, Mathematical models, Coasts, Eutrophication, Sea water, Limiting factors. Identifiers: *Ulva lactuca, Nahant (Mass).

Large benthic algal biomass caused by fertilization hinders water movement in shellfish beds, and during degradation, hydrogen sulfide is released. Nutrients which might be 'limiting' to growth of Ulva lactuca at Nahant, Massachusetts, were Nutrients which might be imming to growth of ulva lactuca at Nahant, Massachusetts, were determined and an algal nutrient response surface showing interaction of two nutrients was constructed. Continuous monitoring gave ammonia nitrogen, nitrate nitrogen, and phosphate phosphorus values. Nitrogen enrichment was made with ammonia nitrogen, the main nitrogen form in domestic sewage, eliminating possibility of the plants' taking up other forms of nitrogen. C-14 incorporation, as a growth parameter, in benthic macrophytes was discussed. Ulva productivity response to phosphate and ammonia enrichments is complex. Ammonia stimulates plant growth at certain concentrations and inhibits productivity at others. Ulva may be stimulated by either ammonia or phosphate, indicating that concept of a limiting nutrient probably is not applicable to define Ulva growth in nature. Productivity was inhibited in ammonia concentrations exceeding 60 micromoles regardless of phosphate concentramicromoles regardless of phosphate concentra-tion. Maximum productivity was observed at am-monia concentration of 43 micromoles and phosphate concentration of 19 micromoles. Baule-Mitcherlich equation is proposed as possible model for nutrient interaction in growth rate determination. (Jones-Wisconsin) W73-10944

CONTROL OF ALGAE, Imperial Chemical Industries Ltd., Jealott's Hill (England). Jealott's Hill Research Station. A. F. Hawkins.

Outlook on Agriculture, Vol 7, No 1, p 21-26, 1973. 2 fig, 1 tab, 40 ref.

Descriptors: *Algal control, *Fungicides, *Algicides, *Herbicides, Nuisance algae, Copper sulfate, Algal toxins, Reservoir design, Turbulence, Diquat, Aquatic weed control, 2-4-D, Dalpon, 2-6-dichlobenil, Irrigation canals, Marine algae, Navigation, Paints, Chlorination, Agronomic crops, Aminotriazole, Urea pesticides, Biocontrol, Rice, Fungicides, Australia. Identifiers: Anti-fouling paints, Maleic hydrazine, Acrolein, Triazines, Xylol, Phytotoxic oils, Diuron, Holland, Organotin fungicides, Fentin acetate, India, Italy, Philippines.

There is an urgent need for short-term measures to alleviate problems caused by algae. Situations where short-term measures are needed or are in use are discussed. The only compound used in quantity on a world scale is cooper sulfate pentahydrate, which presents no danger to mar when used in controlled concentrations. The provision of multiple storage units in pumped storage reservoirs allows them to be taken out of service at times of maximum infestation; similarly, provision of outlets at various levels permits the cleanest water to be drawn off selectively. Future reservoir construction is likely to be designed for maximum depth with minimum surface area—conditions unfavorable for dense algal growths. Another approach is to prevent thermal stratification by installation of pumps. Diquat has been used with success against blooms of blue-green algae in Israel, where algal poisoning is a recurrent problem in small ponds and impoundments. Algae may be resistant to herbicides used for aquatic weed control; in Lake Rotoiti, New Zealand, a heavy infestation of Lagarosiphon major was cleared by diquat, only to be replaced by Nitella. The use and effects of algicides, herbicides, and fungicides in the Netherlands, Australia, United States, and in the Philippines are also described. (Auen-Wisconsin)

POTENTIAL HETEROTROPHY IN A NATURAL POPULATION OF OSCILLATORIA AGARDHII VAR. ISOTHRIX SKUJA, Michigan Univ., Ann Arbor. Dept. of Zoology. G. W. Saunders.

Limnology and Oceanography, Vol 17, No 5, p 704-711, 1972. I fig, 1 tab, 24 ref.

Descriptors: *Algae, *Metabolism, *Plant popula-tions, *Biochemistry, Cyanophyta, Plant growth, Adsorption, Plant growth substances, Plant physiology. Identifiers: *Oscillatoria agardhii, Glucose, physiology. Identifiers: *Oscillatoria agardhii, Glucose, Acetate, Heterotrophy, Dark.

That some algae can grow in the dark on organic substrates has been demonstrated many times in culture. Substrate concentrations, however, are substrates has been demonstrated many times in culture. Substrate concentrations, however, are 1,000 to 100,000 times greater than have been found in uncontaminated waters. The data presented for Oscillatoria agardhii var. isothrix show conclusively that this algae can assimilate glucose in situ in the dark at approximately natural concentrations; it can also assimilate acetate. Three other blue-green algae, Oscillatoria utermoehlii, Oscillatoria sp., and Arthrospira sp., are able to assimilate glucose in the dark and two of these species can also assimilate acetate. They occur maximally in the interphase between aerobic and annerobic conditions and all extend downward into waters containing hydrogen sulfide. Radicatography of the four species tested gives evidence that they can take up glucose-Cl4 and acetate-Cl4 at the low concentrations occurring in lake water. The glucose-Cl4 uptake in the development of algal populations cannot be assessed from the data but the fact that O. agardhii develops massive densities in the microaerobic

Group 5C—Effects of Pollution

200e of many lakes suggests that heterotrophy may be very important to it and perhaps to other species occupying this habitat. (Auen-Wisconsin) W73-10946

'BRINGING SICK LAKES BACK TO HEALTH', Lund Univ. (Sweden). Limnological Inst. Teknisk Tidskrift, No 11, p 1-7, 1972. 7 fig.

Descriptors: "Eutrophication, "Social aspects, "Water pollution effects, Water levels, Adoption of practices, Costs, Thermal stratification, Oxgenation, Aeration, Water pollution treatment, Drainage programs, Harvesting, Wildlife conservation, Project purposes, Rehabilitation, Water birds, Dredging, Environment. Identifiers: "Lake restoration, Lake Trummen (Sweden), Lake Jarla (Sweden), Lake Hornborga (Sweden), Water level reduction.

Limnologists and engineers have cooperated to restore three Swedish lakes of different types, each with suitable different treatment methods. In Lake Trummen, the entire cultural sediment layer was removed; since then the oxygen content dur-ing winter has been excellent and a good environ-ment has been created for fish. However, the ment has been created for fish. However, the building of a motorway along and across the southern part has been proposed; this would completely ruin the restored environmental unit of the lake and its surroundings. The restoration of Lake Jarlasjon was accomplished by aeration utilizing a method of raising the oxygen content in the hypolimnion without disturbing the thermal stratification. The water level of Hornborgasjon has been lowered on several occasions in unsucstratification. The water level of Hornborgasjon has been lowered on several occasions in unsuccessful attempts to obtain arable land. The draining only transformed the lake into a vast marsh. Hornborgasjon had been considered one of the finest waterfowl lakes in Western Europe and it was invaluable both as a migration resting place and as a nesting site for waterfowl. Before the water level could be raised, the damage caused by drainage had to be repaired. The restoration methods for these projects were developed in large-scale field experiments. (Jones-Wisconsin) W73-10947

BIBLIOGRAPHY ON THE ECOLOGY AND TAXONOMY OF MARINE ALGAE, California Univ., San Diego, La Jolia. Inst. of Marine Resources.
M. Neushul, and D. Coon.

Available from the National Technical Informa-tion Service as COM-72-11426, \$3.00 in paper copy, \$0.95 in microfiche. Sea Grant Publication No 21, August 1972. 10 p, 86 ref (IMR Reference

Descriptors: *Marine plants, *Bibliographies, *Ecology, *Systematics, Marine algae, Biological communities, Cytological studies, Biochemistry, Phytoplankton, Benthic flora, Oceans.

In this bibliography of 86 citations, dealing with the extent and diversity of marine algae, published in both foreign and English languages, emphasis is placed on taxonomic and, particularly, ecological studies. Citations are divided into those dealing with marine benthic algae and marine phytoplank ton. Taxonomic studies usually begin with what has been called alpha taxonomy followed by as-sessments that can involve cytological, biochemisessments that can involve cytological, biochemical, numerical and experimental approaches. The spreading, adverse impact of man on world ecosystems makes it imperative that progress is made very rapidly from the first ecological reconnaissance and taxonomic studies through to definitive quantitative ones. One of the most essential tools of the marine ecologist is regional flora. Observations are made on the east and west coasts of the United States. Application of scuba techniques and various methods of sampling in benthic marine habitats are discussed. Autecological studies of benthic marine algae have most frequently emphasized the larger kelps. Of interest are studies of specific oceans, productivity and the growth of marine phytoplankton, populations and general concepts of plankton organization, aspects of physiology and ultrastructure of specific diatoms, chrysophytes in general, and general principles of phytoplankton ecology. (Jones-Wisconsin) W73-10949

CARBON IN FRESHWATER SYSTEMS, Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station. K. G. Wetzel, and P. H. Rich. 1972. 34 P. 5 FIG, 10 REF.

Descriptors: *Carbon, *Freshwater, Carbon dioxide, Photosynthesis, Metabolism, Bicarbonates, Detritus, Productivity, Cycling nutrients, Hydrogen ion concentration, Carbon cycle, Nutrients, Adsorption.
Identifiers: Lawrence Lake (Mich), Carbon flux,

Evidence is available that among the enormous diversity of concentrations and states of inorganic carbon in freshwaters there exist many situations where free carbon dioxide in equilibrium with the diversity of concentrations and states of inorganic carbon in freshwaters there exist many situations where free carbon dioxide in equilibrium with the atmosphere may be inadequate for metabolism or indirectly inadequate as a result of chemical losses from the system. Possession of an affinity for bicarbonate is an adaptive advantage in a significant percentage of aquatic life, particularly for larger submersed angiosperms. The organic carbon budgets as given for Lawrence Lake, Michigan, serve as an example to illustrate the various inputs, losses, and utilization relation of organic carbon. The pelagic organic carbon budget indicates losses of DOC considerably exceed inputs resulting in net production of 17 gC/sq m/yr. In contrast, particulate organic carbon production exceeds losses and results in a total organic net production of 3 gC/sq m/yr for the pelagic zone. The importance of the littoral region, not only its contribution to autochthonous production but also its indirect effects on pelagic and benthic carbon metabolism is emphasized. The concept of net ecosystem productivity is reviewed and applied. The relative contributions by differeing modes of metabolism to dissolved and particulate carbon pools is considered. (Jones-Wisconsin) W73-10950

AQUATIC PLANT CONTROL PROGRAM. Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 04A. W73-10951

AQUATIC PLANT CONTROL RESEARCH PRO-JECT PLAN FY 73-77 (PPB REPORT), Corps of Engineers, Washington, D.C. For primary bibliographic entry see Field 03B.

ECOLOGY OF VIBRIO PARAHAEMOLYTICUS IN CHESAPEAKE BAY, Georgetown Univ., Washington, D.C. Dept. of Biology. T. Kaneko, and R. R. Colwell. Journal of Bacteriology, Vol 113, No 1, p 24-32, January 1973. 3 fig, 5 tab, 35 ref.

Descriptors: *Water analysis, *Zooplankton, Cultures, Water temperature, *Distribution patterns, Sediments, Niches, Seasonal, Marine bacteria, Pathogenic bacteria, Detrius, Separation techniques, Sampling, Population, Biological communities, Path of pollutants, Aquatic populations, Rivers, Estuaries, *Chesapeake Bay. Identifiers: *Vibrio parahaemolyticus, *Culture media, Water quality requirements, Viable counts, Chitin, Rhode River.

The seasonal incidence of Vibrio parahaemolyticus was studied to determine its ecological niche in the natural environment; its habitat and role in the natural environment; its habitat and role in the natural environment; its habitat and role in the natural evices of plankton, water, and sediment; and the mechanisms by which it survives the winter. Samples of sediment, plankton, and water were collected monthly from the Rhode River in Chesspeake Bay. For total viable counts YE and SWYE media were used. Vibrio parahaemolyticus was isolated on TCBS medium. Bacterial counts were made for unfiltered water, filtrates, zooplankton, and sediments. The incidence of Vibrio parahaemolyticus and related vibrios was found to be correlated with water temperature. The vibrios could not be detected in the water column during the winter months, although they were present in sediment. From later spring to early summer, when water temperatures were 14 plus or minus 1 C, vibrios over-wintering in sediment were released from the bottom communities and attached to zooplankton, proliferating as the temperaturer of ca. 19 C. Interaction between sediment, water, and zooplankton was reflected in the water column bacterial population densities at water temperatures of ca. 19 C. Interaction between sediment, water, and zooplankton was sesential in the natural estuarine ecosystem. The bacterial population associated with zooplankton was predominantly on external surfaces and was specific, differing from that of the sediment. Vibrio spp. and related organisms comprised the total bacterial population associated with zooplankton in summer months. The ecological role of Vibrio spp., including Vibrio parahaemolyticus, was significant, with respect to their property of chitin digestion and in relation to the population dynamics of zooplankton in Chesapeake Bay. (Little-Battelle)

EDAPHIC FACTORS OVERRIDE A POSSIBLE GRADIENT OF ECOLOGICAL MATURITY IN-DICES IN A SMALL STREAM, North Carolina Univ., Chapel Hill. Dept. of For primary bibliographic entry see Field 05A. W73-11003

DISSOLVED OXYGEN AND TEMPERATURE IN A STRATIFIED LAKE, Oregon State Univ., Corvallis. Dept. of Civil En-For primary bibliographic entry see Field 05B. W73-11005

GROWTH OF A FLOATING AQUATIC WEED, SALVINIA UNDER STANDARD CONDITIONS, Makerere Univ., Kampala (Uganda). Dept. of Blotany, J. J. Gaudet. J. J. Gaudet. Hydrobiologia, Vol 41, No 1, p 77-106, February 28, 1973. 11 fig, 15 tab, 34 ref.

Descriptors: "Aquatic plants, "Floating plants, Perns, Growth rates, Cultures, Bioassay, Light intensity, Carbon dioxide, Calcium, Strontium, Heavy metals, Nitrogen, Phosphorus, Absorption, Nitrates, Ammonia, Phosphates, Hydrogen ion concentration, Conductance, Dissolved oxygen, Ureas, Sulfates, Iron, Potassium, Sodium, Magnesium, Zine, Manganese, Cobatt, Molybdenum, Aluminum, Copper, Titanium, Nickel, Chromium, Chlorophyll, Plant pigments, Water analysis, Amino acids, Boron. Identifiers: "Salvinia molesta, "Salvinia minima, Culture media, C-14, Tin, Alanine, Glutamine,

Identuriers: "Salvinia motesta, "Salvinia minima, Culture media, C-14, Tin, Alanine, Glutamine, Glutamic acid, Biological samples, Silicon, Scenedesmus species, Synedra, Navicula species, Amphora species, Cymbella, Nitzschia, Surirella, Pediastrum.

Experimental flasks containing basal nutrient medium were inoculated with stock cultures of Salvinia minima or S. molesta and placed in growth chambers for investigation of factors af-fecting growth rates. Determinations were made of

total nitrogen, pigments, amino acids, trace elements and C-14 uptake in plants and pH, conductance, DO, NO3, urea, ammonium, PO4, SO4, total iron, K, Na, Mg, and Ca in water. The results obtained were as follows: (1) Growth of the floating aquatic weed, Salvinia, in sterile culture was exponential for at least 2 weeks under standardized conditions. (2) Increase in light intensity or in CO2 resulted in increases in growth rate, but did not extend the exponential period of growth. (3) This aquatic plant, like many others, discriminates against calcium relative to strontium. (4) In culture Salvinia exhibited luxury consumption of N and P. (5) Because of high C/N ratios, Salvinia may not be a favorable source of animal food, but might be useful in nutrient removal schemes. (6) In sterile culture, Salvinia molesta produced fewer leaves than Salvinia minima, but maintained a significant increase in leaf area and maintained a significant increase in leaf area and dry weight. This may be correlated with the ability of the first species to rapidly spread over tropical waterways. (Little-Battelle) W73-11007

ALGAL RESPONSE PHOSPHATE LEVELS, RESPONSE TO DETERGENT

North Carolina Univ., Chapel Hill. School of Public Health.

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D. E. Francisco, and C. M. Weiss.

Journal Water Pollution Control Federation, Vol
45, No 3, p 480-489, March 1973. 5 fig, 7 tab, 15

Descriptors: *Aquatic algae, *Detergents, *Phosphates, *Bioassay, Waste water (Pollution), Water pollution, *Eutrophication, Nutrients, Plant growth, Sewage treatment, Tertiary treatment, Water sampling, Water analysis, Physicochemical properties, Chlorophyta, Sewage effluents, Biochemical oxygen demand, Carbon, Suspended solids, Nitrates, Nitrites, Ammonia, Alkalinity, Hydrogen ion concentration, Chemical analysis, Aquatic plants, *North Carolina. Identifiers: *Selenastrum capricornutum, Organic carbon, Kjeldahl nitrogen, Lake Michie, University Lake.

Algal assays were performed on treated waste-waters, some containing phosphate detergents and others containing a non-phosphate detergent. The controls for the bioassay were established using raw wastewater. Each test and control culture was prepared in triplicate, with a total volume of 100 ml in a flask seeded with 1000 cells/ml of the test alga, Selenastrum capricornutum. The flasks were capped loosely with aluminum foil, incubated at 24 C under 400 ft-c of cool-white fluorescent illuination, and swirled once daily. Growth respon of the test alga was determined at 3, 5, 7, 10, and 14 days by hemocytometer counting. For growth comparison, the standard algal assay medium (NAAM) was used. In general, phosphate detergent wastewater allowed the same growth as did non-phosphate detergent wastewater at each level non-phosphate detergent wastewater at each lever of treatment. Tertiary treatment for phosphorus removal resulted in much less growth than secon-dary treatment. Tertiary-treated phosphorus deter-gent wastewater allowed significantly greater growth than the non-phosphorus wastewater at a concentration of 2 percent. Simply removing de-tergent phosphates from wastewater apparently will not control eutrophication, except where the receiving water is very strongly phosphoruswar not control cutrophication, except where the receiving water is very strongly phosphorus limited and wastewater is the principal phosphorus source, but may allow significantly better tertiary phosphorus removals. (Holoman-Battelle) W73-11008

ZOOGLOEA BACTERIUM MUCOPOLYSACCHARIDE GELATINOUS MATRIX

Tokyo Metropolitan Univ. (Japan). Dept. of Biolo-

For primary bibliographic entry see Field 05A. W73-11009

ENTERIC VIRUS SURVIVAL IN ALGAL-BA-CTERIAL WASTEWATER TREATMENT SYSTEMS-I. LABORATORY STUDIES, California Univ., Berkeley. School of Public For primary bibliographic entry see Field 05D.

THE REACTIONS OF ROACH (RUTILUS RUTI-LUS (L.)) TO CHANGES IN THE CONCENTRA-TION OF DISSOLVED OXYGEN AND FREE CARBON DIOXIDE IN A LABORATORY

Ministry of Agriculture, Fisheries and Food, Lon-don (England). Salmon and Freshwater Fisheries

B. Stott, and D. G. Cross. Water Research, Vol 7, No 5, p 793-805, May 1973. 3 fig, 6 tab, 14 ref.

Descriptors: *Dissolved oxygen, *Carbon dioxide, Water pollution effects, *Bioassay, *Fish behavior, Channels, Anaerobic conditions, Fresh-water fish, Oxygen sug, Laboratory tests, Labora-tory equipment, Volumetric analysis, Anaerobic conditions.

Identifiers: Rutilus rutilus, *Avoidance reactions, *Roach, Dropping mercury electrode.

Experiments were carried out with roach (Rutilus rutilus) in a laboratory channel to determine their behavior in relation to levels of dissolved oxygen and free carbon dioxide. The channel was made by and free carbon dioxide. The channel was made by joining 9 iron-framed glass aquaria by PVC pipe set in marine plywood at the end of the aquaria. The sides of the aquaria were covered with polyethylene sheeting to prevent the fish seeing out. Dechlorinated, deoxygenated water was used and N2 was bubbled through aerators to replace the air above the channel. Before experiments on avoidance reactions were started between 25 and 30 pages, 10.12 cm long, were introduced into the 30 roach, 10-12 cm long, were introduced into the apparatus, confined to an area consisting of either tanks 1-4, or 1-5, and fed on Tubifex and Daphnia. tanks 1-4, or 1-5, and fed on Tubifex and Daphnia.
The fish were kept in the original area for at least 5
weeks before a homing experiment was attempted.
This consisted of opening the gate at the
downstream end of the area and driving the fish to
tanks 8 or 9 with a hand net and the light from a
torch. All the gates in the channel were then closed
and the fish allowed about 1 h to settle down before all the sates were accessed by remote ceand the fish allowed about 1 h to settle down be-fore all the gates were re-opened by remote con-trol. Subsequently the positions of the fish were noted at intervals of about 2 h. Falling concentra-tions of dissolved oxygen in the channel caused the roach to move downstream to better ox-ygenated water by means of a predominantly ap-propriate response. When an aerated water flow ygenated water to means or a precommanty ap-propriate response. When an aerated water flow was restored the fish quickly reoccupied their original position. Fish newly introduced into the channel responded in a similar manner except that they did not return to the original position. Roach acclimated to a reduced level of dissolved oxygen accimated to a reduced revel of unsolved oxygen needed a rather lower oxygen level to cause the downstream movement. An increase in the amount of free carbon dioxide together with a reduction in oxygen content induced fish to respond to higher levels of oxygen than if the oxygen only was reduced. (Holoman-Battelle) W73-11011

TOXICITY, RESIDUE DYNAMICS, AND REPRODUCTIVE EFFECTS OF PHTHALATE ESTERS IN AQUATIC INVERTEBRATES, Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab. H. O. Sanders, F. L. Mayer, and D. F. Walsh. Environmental Research, Vol 6, No 1, p 84-90, March 1973. 3 tab, 22 ref.

Descriptors: *Crayfish, *Midges, Mayflies, Toxicity, Bioassay, Reproduction, Absorption, Daphnia, Water pollution effects, Acaricides, Pesticide toxicity, Pesticide residues, Crustaceans, Invertebrates, Nymphs.

Identifiers: *Phthalate esters, *Biological magnifi-cation, *Scuds, *Glass shrimp, *Palaemonetes kadiakensis, *Aquatic sowbug, Bioaccumulation, Plasticizers, Daphnia magna, Gammarus pseu-dolimnaeus, Orconectus nais, Asellus brevicau-dus, Ischnura verticalis, Hexagenia bilineata, Chironomus plumosus, Phthalate esters, Macroin-vertebrates.

Scuds (Gammarus pseudolimnaeus), glass shrimp (Palsemonetes kadiakensis), crayfish (Orconectes nais), waterfleas (Daphnia magna), aquatic sowbugs (Asellus brevicaudus), and three species of immature aquatic insects, damselfly nymphs (Ischnura verticalis), burrowing mayflies (Hexagenia bilineata), and midge larvae (Chironomus plumosus) were collected from streams and ponds in Missouri for use in studying the bioaccumulation, biomagnification, and toxicity of di-2-ehylnexyl and di-n-butyl phthalates. Acute toxicity tests were conducted for 96 hours under static conditions as TL50 values. Accumulation experiments were conducted in an intermittent-flow system. The phthalate esters were labeled with C-14 for radiometric analysis of water and organisms. Reproductive tests were conducted with Daphnia in the intermittent-flow system with concentrations of 3, 10, and 30 ppb. The acute toxicities were low and ranged from 2.1 mg/liter to greater than 32 mg/liter. Residue accumulation was rapid resulting in body residues 70-13,600 times that of the water concentration. Phthalate residues were essentially gone after 10 days in fresh water. A reproductive impairment of 60 percent occurred in Daphnia magna exposed continuously to 3 ppb of di-2-ethylhexyl phthalate. (Little-Battelle)

MICROBIAL COMMUNITY STRUCTURE IN CONTAMINATED ESTUARIAN SEDIMENTS, North Texas State Univ., Denton.

A. Roach, J. K. G. Silvey, and R. K. Guthrie. Journal Water Pollution Control Federation, Vol 45, No 2, p 365-368, February 1973. 2 fig, 13 ref.

Descriptors: *Biological communities, *Estuarine environment, *Sediments, *Distribution patterns, *Bacteria, Sampling, Ecology, Culture, *Texas, Identifiers: Data interpretation, Culture media

Punch cores were taken at 4-m intervals along transects in estuarian flats near Flour Bluff, Texas. One tenth ml of mud from a subcore drawn at 2 dm of each core and at each 0.5 dm of the cores was diluted 1:1,000 and placed on an extract mediwas diluted 1:1,100 and piaced on an extract medium. The extract medium was designed to give the broadest possible cross section of microbial population and was prepared by (1) adding 300 ml of deionized water to 500 g of mud; (2) cooking for 30 minutes at 90C in a double boiler; (3) allowing mud minutes at 92. In a double owner; 193 andwing must to settle and decanting; (4) adding 2 g yeast ex-tract, 15 g mannitol, 0.5 g each of calcium suffate and magnesium sulfate, 20 g agar, and sufficient deionized water to make 1 liter. Frequencies were deionized water to make I liter. Frequencies were plotted for each organism encountered on five plates per subcore sample. A Raunkineran frequency spectral analysis showed that a structured community rather than a heterogeneous mixture existed laterally over the space of some 80 m in uniform bottom mud. Moreover, such structure resembled that of an undisturbed, climax surface community. community. A community coefficient analysis showed no significant stratification or vertical discontinuity to a depth of 9 dm. (Little-Battelle) W73-11025

TOXIC EFFECTS OF MERCURY ON THE AC-

TIVATED SLUDGE PROCESS,
Maine Univ., Orono. Dept. of Civil Engineering.
M. M. Ghosh, and P. D. Zugger.
Journal Water Pollution Control Federation, Vol
45, No 3, p 424-433, March 1973. 8 fig. 7 tab, 20

Group 5C-Effects of Pollution

Descriptors: "Mercury, "Activated sludge, "Toxicity, "Chemical oxygen demand, "Biomass, "Aerobic conditions, Heavy metals, Reduction (Chemical), Growth rates, Artifical substrates, Absorption, Oxygen.
Identifiers: Volatile suspended solids, Substrates

A study to determine the toxic effects of mercury on the activated sludge process was made in the laboratory under controlled batch-fed conditions. The threshold mercury concentrations that were required to inhibit biological activities were between 2.5 and 5.0 mg Hg (2 plus)/1, when the food: microorganism ratio was 1.0 and the mixed figuor volatile suspended solids concentration was 2,000 mg/1. However, at dosages as high as 10.0 mg Hg (2 plus)/1, recovery occurred within a few hours. Chemical oxygen demand reduction was obtained in the samples having higher mercury concentrations, but the demand reduction and growth of sludge were both reduced from the conditions present in the nonstressed studies. (Holoman-Battelle)

OSMOTIC REVERSAL OF TEMPERATURE SENSITIVITY IN ESCHERICHIA COLI, SENSITIVITY IN ESCHERIC HIA COLL, Ottawa Univ. (Ontario). Dept. of Biology. A. Z. Bilsky, and J. B. Armstrong. Journal of Bacteriology, Vol 113, No 1, p 76-81, January 1973. 4 fig, 2 tab, 25 ref.

Descriptors: Temperature, "Pollutant identifica-tion, "Osmosis, Antibiotics (Pesticides), Stability, Isolation, Environmental effects, "E. coli, Sodium chloride, Coliforms, Enteric bacteria, Aerobic

chloride, Coliforms, Enteric bacteria, Aerobic bacteria.

Identifiers: *Mutants, E. coli K-12, *Sensitivity, Bacterial physiology, Biochemical tests, Culture media, Glycerol, Sucrose, Inositol, Potassium chloride, Magnesium chloride, Valinomycin, Lincomycin, Streptomycin, Vancomycin, Bacitracin, Novobiocin, Osmolality, Mutagenicity, N-methyl-N-nitro-N-nitrosoguanidine, Growth media, Deoxycholate, Methylene blue, Ethylenediaminetetra-acetic acid, Acridine orange, Acriflavine, Triphenyl tetrazolium chloride.

Forty temperature-sensitive mutants, unable to grow on tryptone or nutrient agar at 42C, were isolated from Escherichia coil K-12. When 0.5 percent NaCl was added to the medium, 32 grew at the nonpermissive temperature. Several were tested with different amounts of NaCl added to of the medium was between 400 and 1,000 milliosmolal. One of the mutants was studied in more detail. Sucrose, invasited VC liosmoial. One of the mutants was studied in more detail. Sucrose, inositol, KCl, and MgCl2, as well as NaCl, permitted growth at 42C. Glycerol, however, had no effect. When shifted from 30 to 42C without osmotic protection, the mutant stopped growing but did not lyse, die, or leak significant amounts of intracellular material. In a similar shift experiment, a second mutant leaked all of its trichloroacetic acid-soluble pools into the medium. The majority of the mutants were hypersensitive to certain antibiotics, indicating possible cell envelope defects. (Holoman-Battelle) W73-11028

RADIATION-RESISTANT MUTANTS OF SAL-MONELLA TYPHIMURIUM LT2: DEVELOP-MENT AND CHARACTERIZATION. Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science. For primary bibliographic entry see Field 05B. W73-11029

OBSERVATIONS ON THE TRANSPARENCY OF THE WATERS OF THE PULICAT LAKE WITH PARTICULAR REFERENCE TO PLANK-TON PRODUCTION, Central Inland Fisheries Research Inst., Madras (India).

M. Kaliyamurthy.

Hydrobiologia, Vol 41, No 1, p 3-11, February 28, 1973. 5 fig, 1 tab, 14 ref.

Descriptors: "Zooplankton, "Phytoplankton, "Light penetration, "Aquatic productivity, Primary productivity, Secondary productivity, Turbidity, Plankton nets, Aquatic life, Secchi disks, Tidal effects, Estuarine environment. Identifiers: "Transparency, Seasonal variation, "India (Pulicat Lake).

The relationship of the transparency of the waters of Lake Pulicat to plankton productivity was investigated for the period January 1968 to December 1970. Light penetration was measured at varying times with a Secchi disc 20 cm in diameter from a stationary boat. Simultaneously, plankton was collected by hauling a 50-cm diameter tow net for 15 minutes. The plankton was fixed in 5 percent formalin and counted using a Sedgwick-Rafter counting cell. Marked sectoral and seasonal variations were observed in relation to transmatter counting ceit. Marked sectoral and seasonal variations were observed in relation to transparency but no tidal effects were noted. Varying relationships were noted between plankton and the attenuation coefficient 'k' in the two sectors, of the Lake. (Holoman-Battelle) W73-11046

THE EFFECTS OF POLLUTION ON GAM-MARUS PULEX (L) SUBSP, PULEX (SCHEL-LENBERG) IN THE INLET STREAMS OF ROSTHERNE MERE, CHESHIRE, Northumberland Coll. of Education, Newcastle-upon-Tyne (England). Dept. of Environmental Science.

Science.
J. E. Hobrough.
Hydrobiologia, Vol 41, No 1, p 13-35, February
28, 1973. 12 fig, 7 tab, 21 ref.

Descriptors: *Water pollution effects, *Life history studies, Amphipoda, Physical properties, Chemical properties, Water sampling, Benthic fauna, Juvenile growth stage, Resistance, Freshwater, Crustaceans, Invertebrates, Aquatic animals, Dissolved oxygen, Water temperature, Biochemical oxygen demand, Electrolytes, Acidity, Hydrogen ion concentration, Diptera, Stoneflies, Streamflow, Mature growth stage, Breeding, Farm wastes, Drainage water, Roads, Breeding, Farm wastes, Drainage water, Roads. Breeding, Farm wastes, Drainage water, Roads, Midges, Animal populations.

Identifiers: *Macroinvertebrates, *Gammarus pu-

lex, *Rostherne Brook, *Dolls Meadow, England Scuds, Polycelis felina, Substrates, Chironomids.

Two inlet streams, Rostherne Brook and the Southern Drain of Dolls Meadow, flowing into Rostherne Mere, Cheshire were sampled for macroinvertebrata, and their physical and chemical conditions analyzed. The physical and chemical factors for these streams were similar, except for the stream beds and the pollution of Rostherne Brook. Both streams had large populations of Gammarus pulex and the life history of this organism was studied. The ratio of adult organism to juvenile differed in the two streams, Rostherne Brook having a higher proportion of adults in winter and juveniles in summer as opposed to the Southern Drain in which a normal life history was exhibited. Experiments showed that these differences were not related to differences in stream ferences were not related to differences in stre bed conditions. It was considered that the dif-ferent adult to juvenile ratios were therefore caused by pollution in Rostherne Brook. The juveniles were more tolerant to pollution and there-fore more able to survive the summer when pollu-tion effects were at a maximum. The life history uon effects were at a maximum. The life history was altered in Rostherne Brook by pollution. Instead of the dual life history produced by overwintering juveniles and speedy summer maturation, a simple alternation of juveniles and adults was seen. This change in life history enabled Gammarus to survive in the polluted waters of Rostherne Brook. (Holoman-Battelle) W77.11047. MICROBIAL DECOMPOSITION OF PENTACHLOROPHENOL,
Purdue Univ., Lafayette, Ind. School of Civil En-For primary bibliographic entry see Field 05B. W73-11048

5D. Waste Treatment Processes

TECHNICAL, ECONOMIC AND LEGAL ASPECTS INVOLVED IN THE EXCHANGE OF SEWAGE EFFLUENT FOR IRRIGATION WATER FOR MUNICIPAL USE, CASE STUDY -CITY OF TUCSON, Arizona Water Resources Research Center, Tuc-

son. C. B. Cluff, K. J. DeCook, and W. G. Matlock. Available from the National Technical Informa-tion Service as PB-220 948, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, December 1972. 74 p. 17 fig, 14 tab, 35 ref. OWRR A-022-ARIZ (6). 14-31-0001-3203.

Descriptors: "Water transfer, "Sewage effluents, "Institutional constraints, Economic efficiency, Legal aspects, "Water reuse, "Irrigation water, Water pollution control, Crop response, "Arizona, "Water districts, Nutrients. Identifiers: Metropolitan wastewater districts, Wastewater recharge, "Tucson, Region.

Wastewater recharge, "Tucson, Region.

A case study of the Tucson region illustrates the relevant legal, economic and technical aspects of transferring high quality irrigation water to municipal use in exchange for nutrient-rich treated sewage effluent. In effect, irrigation water would be cycled through the municipal system prior to use on the farms, utilizing existing or new pipelines and evidently without modification of existing statutes. Three basic plans could be instituted in the Tucson region: (1) Exchange with a nexisting irrigated district covering existing irrigated lands; and (3) exchange with a proposed consolidated district owned and operated by metropolitan agencies. To varying degrees, these alternative plans offer the capability of distributing much of the treated effluent over irrigated acreages of crops already being grown in the Avra-Marana area, at delivery cost competitive with that of pumped water. Under each system, the efficiency of use depends upon seasonal blending or alternating of effluent with ground water, in proper proportions. Approximately 20,000 acres would be required to efficiently utilize the projected 1995 effluent production. Any such system contains the inherent advantage of a water-quantity multiplying factor due to reuse. Similar exchange arrangements may prove to be feasible in other regions contains in instance and contains the other regions contains in instance and contains the other regions contains in instance are contains the other regions contains in the regions of the production. Any such system contains the inherent advantage of a water-quantity multiplying factor due to reuse. Similar exchange arrangements may prove to be feasible in other regions containing intended agriculture. exchange arrangements may prove to be feasible in other regions containing irrigated agriculture. W73-10402

THE HYDRAULICS OF WASTE STABILIZATION PONDS, PART I. THE EFFECT OF HYDRAULIC FLOW CHARACTERISTICS ON TREATMENT EFFICIENCY, PART II. THE EF-FECT OF WIND ON MIXING IN STRATIFIED AND UNSTRATIFIED PONDS. Utah Center for Water Resources Research,

Logan.

G. Z. Watters, K. A. Mangelson, and R. L. George.

Available from the National Technical Information Service as PB-220 955, \$3.00 in paper copy,

\$9.050 in microfiche. Publication PRCWRR18-1,

February 1973. 100 p., 64 fig., 13 tab., 65 ref. OWRR

A-008-UTAH (4). 14-31-0001-3545.

Descriptors: *Hydraulic flow, Mixing, Sewage lagoons, Dye concentrations, *Tracers, Hydraulic models, Density stratification, Baffles, Diffusion, Treatment, Dispersion, Stratification, Prototypes, *Utah, *Oxidation lagoons, *Waste water treatment. ment. Identifiers: Logan (Utah), Rhodamine WT, Fluorometer, Cache Valley.

The treatment efficiency of waste stabilization ponds can be influenced significantly by the hydraulic flow patterns within the ponds. To evaluate the effects of shape and depth of the ponds, placement of inlets and outlets, baffling and density stratification an hydraulic model of the prototype Logan City ponds was constructed. The mixing properties of the model ponds were evaluated by injecting a slug of rhodamine WT dye into the inflow and measuring the dye concentration vs time at the outlet. Concentration curves represent the time each dye particle remains in the pond. Coupling this information with the first-order reaction equation provides a measure of treatment efficiency. The position of inlets and outlets was found to change treatment efficiency by about 20%; however, with proper baffling virtually ideal treatment efficiences were obtained. A mathematical (finite-stage) model of the mixing process was adapted to stabilization ponds to determine if a more theoretical design was feasible. The model can be combined with the first-order reaction equation to predict treatment efficiency. A windware tunnel was constructed to simulate a windover-water situation. A relationship between wind velocity and surface shear stress was established. Diffusion coefficients describing the wind driven mixing of an injected dye were evaluated as functions of the surface shear-velocity Reynolds number. For constant density flows the diffusion coefficient tended toward stabilization at higher Reynolds numbers. The upwind diffusion coefficient threats down and complete mixing occurs was established as a function of density differences and relative thicknesses of the two layers.

W73-10414

EFFECTS OF IRON ON ACTIVATED SLUDGE

TREATMENT,
Marquette Univ., Milwaukee, Wis.
J. L. Carter, and R. E. McKinney.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99,
No EE2, p 135-152, April 1973. 9 fig, 3 tab, 24 ref.

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Descriptors: "Activated sludge, "Iron, "Sewage treatment, "Metabolism, Heavy metals, Chemical oxygen demand, Biochemical oxygen demand, Biochemical oxygen demand, Temperature, Hydrogen ion concentration, Dissolved oxygen, Suspended solids, Sewage effuents, Chemical reactions, Sewage bacteria, Chemical analysis, Reduction (Chemical), Nutrients, "Waste water treatment.

Nutricus, waste water treatment. Identifiers: Pollutant effects, "Substrate utilization, Studge volume index, Volatile suspended solids, Actinomycetes, Sewage microorganisms, Settleability, Standard methods.

Research was conducted in order to relate the iron ion concentration with the rate of biological metabolism as well as sludge bulking conditions in activated sludge treatment. Five-liter batch activated sludge units were fed glucose and an inorganic substrate using a typical fill and draw procedure. Sodium bicarbonate buffer was used to minimize the precipitation of important elements. Various concentrations of iron were fed during this study. Tests consisting of COD, BOD, ML-SS, ML-VSS, and sludge volume index (SVI) were conducted to evaluate these systems. Other related parameters such as temperature, pH, dissolved oxygen, and individual ion analysis were periodically measured. Iron was measured using the tripyridine method described in 'Standard Methods'. Rates of metabolism were determined by measuring the soluble COD and ML-VSS for various time intervals after feeding. Microscopic by measuring the soluble COD and MLVSS for various time intervals after feeding. Microscopic observations were conducted regularly throughout the research. This work showed that insufficient iron in activated studge treatment systems decreases the rate of organic metabolism and causes bulking conditions. Variations in other biological treatment parameters may be associated with iron or other inorganic nutrient limitation conditions. (Holoman-Battelle)

W73-10512

SIMULTANEOUS QUANTITATION OF SAL-MONELLA SPECIES AND PSEUDOMONAS AERUGINOSA. I. POLLUTED WATERS. II. PERSISTENCE OF PATRIOGENS IN SLUDGE TREATED SOILS. III. ANALYSIS OF WASTE TREATMENT SLUDGES FOR SALMONELLA SPECIES AS A SURVEILLANCE TOOL, National Environmental Research Center, Cincin-nati, Ohio.

For primary bibliographic entry see Field 05B. W73-10549

POLLUTION ABATEMENT PROCESS FOR REFINERY WASTE WATER, Texaco Inc., New York. (assignee). J. P. Tassoney, and R. M. Dille. U. S. Patent No. 3,725,270, 5 p, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 315, April 3, 1973.

Descriptors: *Patents, Sulfides, Fuels, *Hydrogen sulfide, Gases, *Industrial wastes, *Oil wastes, Oily water, Pollution abatement, *Waste water treatment, Water quality control, Water pollution control, Chemical reactions. Identifiers: *Refinery wastes, Sour water.

A stream of refinery waste water is introduced into a refractory-lined reaction zone of a free-flow noncatalytic synthesis gas generator in admixture with a hydrocarbonaceous fuel. By the partial oxwith a hydrocarbonaceous fuel. By the partial exidation reaction at an autogenous temperature in the range of 1500 to 3000 deg F and a pressure in the range of 1 to 250 atmospheres, the feed to the gas generator is reacted with an oxygen rich gas to produce a hot effluent stream of synthesis gas comprising a mixture of H2, CO, CO2, and H2O and containing a relatively minor amount of H2S, COS, A, N2, CH4 and particulate carbon. The H2S may be recovered and the purified water may be released for disposal. (Sinha-OEIS) W73-10582

PROCESS FOR REMOVING METAL COMPOUND CONTAMINANTS FROM WASTE WATER.

Haviland Products Co., Grand Rapids, Mich. (as-

U. S. Patent No. 3,725,266, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 314, April 3, 1973.

Descriptors: *Patents, *Industrial wastes, *Metals, *Waste water treatment, Pollution abatement, *Carbonates, Aluminum, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Zinc.
Identifiers: Silver, Tin, *Hydroxides.

One or more precipitating agents such as hydroxides and carbonates are added to the contaminated water to form a sludge. After settling the sludge is removed and placed in a centrifuge for further treatment. The supernatant liquid may then be disposed without damage to the environment. Fifteen examples are cited. The metal compounds which may be removed in this manner are: also which may be removed in this manner are: aluminum, cadmium, copper, chromium, iron, manganese, mercury, lead, nickel, silver, tin, and zinc. (Sinha-OES) W73-10584

WASTE WATER TREATMENT PROCESS Signal Oil and Gas Co., Los Angeles, Calif. (assignee).

U. S. Patent No. 3,725,264, 4 p, 1 fig, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 314, April 3, 1973.

Descriptors: *Patents, Pollution sources, *Oil wastes, *Oil pollution, Separation techniques, *Nickel, *Waste water treatment, Catalysts, Chemical reactions, Pollution abatement, *Oil industry, *Industrial wastes.

Controlled amounts of oxygen, air, and a catalyst are injected into waste water containing residual oil and dissolved sulfides. The mixture is pumped under pressure into a flotation cell or tank where the pressure is released and the sulfur and oil are separated from the water by flotation. The catalyst may be any effective water soluble compound, preferably a nickel compound. Three examples are cited. (Sinha-OEIS)
W73-10585

WASTE WATER TREATMENT, R. H. Harris, and E. F. Morey. U. S. Patent No. 3,725,263, 5 p, 6 fig, 7 ref; Offi-cial Gazette of the United States Patent Office, Vol 909, No 1, p 314, April 3, 1973.

Descriptors: "Patents, "Coagulation, "Filtration, Chemical reaction, Turbidity, "Waste water treat-ment, Pollution abatement, Water quality control, Polymers, Frilters. Identifiers: Alum, Ferric sulfate.

A pilot filter apparatus uses a coarse to fine mixed bed or dual bed filter media and continuously monitors and compares the turbidity of chemically treated water passing through a point intermediate the length of the bed with the turbidity of water passing from the filter as final effluent. The clarifi-cation chemicals recommended are about ferrication chemicals recommended are alum, ferric sulfate, or organic polymers. (Sinha-OEIS) W73-10586

REMOVAL OF MERCURY FROM LIQUIDS USING KERATIN DERIVATIVES, Department of Agriculture, Washington, D.C. (as-

ee).

M. Pricuman.
U. S. Patent No. 3,725,261, 3 p, 2 ref; Official
Gazette of the United States Patent Office, Vol
909, No 1, p 313, April 3, 1973.

Descriptors: *Patents, *Waste water treatment, *Mercury, *Metals, Chemical reactions, Water quality control, Pollution abatement, Water pollution control. entifiers: *Keratin, Chemical treatment

Water containing mercury is treated with a keratin derivative. The keratin derivative acts as an absorderivative. The keratin derivative acts as an absorbent and the mercury becomes bound to the keratin. Three examples are cited. Suspended particles of elemental mercury may be removed by physical entrapment. In the keratin treatment the reaction is conducted at room temperature but the reaction may be speeded up by increasing the temperature. It is preferred that atmospheric oxygen be excluded from the reaction system. The exclusion is attained by sweeping a non-oxidizing gas such as nitrogen or helium through the system. (Sinha-OEIS)

PROCESS FOR RECOVERY OF MINERAL POLLUTANTS FROM ACIDIC WASTE STREAMS, Aerojet-General Corp., El Monte, Calif. (as-

D. O. DePree.

U. S. Patent No. 3,725,259, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 313, April 3, 1973.

Descriptors: "Patents, "Acid mine water, Streams, Lakes, Rivers, "Waste water treatment, "Industri-al wastes, Pollution abatement, "Metals. Identifiers: "Metal salts removal, Pickling plants, Electroplating baths.

Group 5D—Waste Treatment Processes

The acidic waste stream is led to the weak acid ca-The actinc waste stream is ten to the weat actin carbon exchange bed in a countercurrent pass. The cation exchange resin in the bed removes the metals from the stream. The stream then moves on a neutralization zone. Lime or calcium carbonate is introduced into the neutralization zone. special partition of the special speci

APPARATUS FOR CLEANING SEWAGE WATER, Adaks Products Inc., (assignee). H. K. Heen.

U. S. Patent No. 3,725,205, 6 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 301, April 3, 1973.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Evaporators, *Condensation, Equipment, Water quality control, *Distillation, Pollution abatement.

Sewage water is fed to a surge tank, and from there, periodically and in predetermined quanti-ties, through a batching valve to a sealed evaporator tank, which is surrounded adjacent its lower end by a condensing chamber. When the level of the liquid in the evaporator drops to a predeter-mined low limit, sensing means opens the batching valve momentarily to fill the tank, thereby starting valve momentarily to fill the tank, thereby starting a vacuum pump which reduces the pressure in the tank and chamber approximately to the saturated vapor pressure in the tank. A vapor fan then pumps vapor from the tank to the chamber, where the vapor condenses and transfers heat to the remaining sewage water in the tank. Periodically the slurry in the tank is automatically discharged and incinerated. (Sinha-OEIS) and incinera W73-10590

APPARATUS FOR MONITORING AND CON-TROLLING HALOGEN LEVELS IN A WATER TREATMENT SYSTEM.

Halogen Controls, Inc., Barrington, Ill. (assignee).
For primary bibliographic entry see Field 05F.

PROCESS FOR REMOVAL OF AMMONIA FROM WASTE WATER STREAMS,

U. S. Patent No. 3,723,308, 7 p, 1 fig, 9 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 1116, March 27, 1973.

Descriptors: *Patents, *Ammonia, *Municipal wastes, *Agricultural runoff, *Industrial wastes, Ion exchange, *Waste water treatment, Pollution abatement, Water quality control, *Zeolites.

Ammonium ions are removed from aqueous solu-Ammonum rous are removed from addeduct soft-tions containing one or more alkali or alkaline earth cations by effecting the removal with Zeolite F, a synthetic crystalline aluminosilicate having a silica to alumina oxide mol ratio of about 2 and having been derived from a potassium-rich reac-tion mixture. (Sinha-OEIS)

APPARATUS FOR TREATING WASTE

Pollutrol Industries, Inc., Portland, Maine. (assignee). K. L. Rost.

U. S. Patent No. 3,721,344, 5 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 908, No 3, p 625, March 20, 1973.

Descriptors: "Patents, "Waste water treatment, Equipment, "Aeration, "Pollution abatement, Water pollution control, Water quality control, Settling basins.

Identifiers: "Settling chambers.

This apparatus consists of two chamb This apparatus consists of two chambers, the first for the reception of waste water and the second which functions as a settling chamber. Each chamber has a device for aeration. The second chamber has a discharge provided with an overflow inlet and an expansion chamber extending downward into it. Means are provided to deliver air into the expansion chamber to force water out of it thus to raise the second chamber level to cause an overflow through the discharge, the overflow being relatively clear after a predetermined settling interval. (Sinha-OEIS) W73-10600

MACHINE FOR REMOVING SEDIMENTARY MATERIAL FROM FILTER BEDS, Gewerkschaft Eisenhuette (West Germany). (as-

ry bibliographic entry see Field 05F. For primar W73-10602

WATER PURIFYING DEVICE, For primary bibliographic entry see Field 05F. W73-10605

FILTRATION PROCESS FOR CLARIFICA-

TION, Erbara-Infilco Ltd., Tokyo (Japan). (Assignee For primary bibliographic entry see Field 05F. W73-10606

SURFACTANTS IN SEWAGE AND THEIR POSSIBLE REMOVAL, (IN ITALIAN), Stazione Sperimentale degli Olii e dei Grassi,

Statzone Sperimentate degit Offi e dei Grassa, Milan (Italy).

A. Arpino, G. Mariani, and N. Quarenghi.
Riv Ital Sostanze Grasse. Vol 49, No 3, p 121-127, 1972. Illus. English summary.
Identifiers: "Sewage, "Surfactants, Waste water treatment, Treatment facilities.

An experimental study to remove surfactants from sewage is presented together with a treatment plant scheme. The described procedure is essen-tially based on the physical principle of blowing in air and removing the foam produced; the plant is completed by a foam combustion zone. By com-paring the initial data with those obtained after some years of operation, and considering the oc-currence of various types of surfactants in waters treated, an average qualitative yield of about 91% is expected. Results obtained may be considered astisfactory, considering that naphtha consumption, even though not a minor factor, represents practically the sole element of plant operation cost.—Copyright 1973, Biological Abstracts, Inc. W73-10634

WATER QUALITY MANAGEMENT PLAN, IN-TERIM ST. CROIX RIVER BASIN. Creative Research Services, Inc.

For primary bibliographic entry see Field 05G. W73-10689

EFFECTIVE MIXING IN SHALLOW BODIES OF WATER WITH AND WITHOUT DENSITY STRATIFICATION,

Utah State Univ., Logan.
K. A. Mangelson, and G. Z. Watters.
Paper presented at the 19th Annual Specialty Conference, Hydraulics Div., American Society of Civil Engineers, Iowa City, Iowa. August 1971. 27
p., 18 fig. OWRR A-008 Utah (2). 14-31-0001-3345.

Descriptors: *Dispersion, Hydraulics, *Time of concentration, *Tracers, Baffles, Hydraulic models, *Oxidation lagoons, Waste water treatment, Treatment facilities, *Mixing, *Density stratification.

Very little attention has been given to the hydrau-lics characteristics of waste stabilization ponds in

the past. From physical observations of the Logan City waste stabilization ponds as well as from distorted model studies of these ponds, this study has demonstrated the hydraulic characteristics of shallow bodies of water under several different conditions of inflow, outflow and design of the pond, and the effects of mixing within the body on the resulting age distribution of tracer elements. While a complete description of the dispersion process is not given, a practical description, by parameters which describe the degree of mixing is used to measure the performance of the ponds. (Jeppson-Utah) W73-10719 (Jeppson-U W73-10719

THE FEASIBILITY OF FLOW SMOOTHING STATIONS IN MUNICIPAL SEWAGE STATIONS IN SYSTEMS,

arch Triangle Inst., Durham, N.C. C. N. Click

C. N. Click.

Copy available from GPO Sup Doc as EP1.23/2:
73-138, \$1.25; microfiche from NTIS as PB-221
246, \$0.95. NTIS paper copy \$3.25. Environmental
Protection Agency, Technology Series Report
EPA-R2-73-138. February 1973. 94 p, 17 fig. 2 tab,
21 ref. EPA Project 11010 FDI. Contract 14-12-

Descriptors: *Surge tanks, *Sewers, *Economic feasibility, *Domestic wastes, Waste water (Pollution), Municipal wastes, Sewage, Sanitary engineering, Water pollution control, Feasibility studies, *Cost comparisons, Estimated benefits, *Design criteria, *Hydraulic conduits, Sewerage, Waste water treatment.
Identifiers: *Flow smoothing, Flow Equalization.

Flow smoothing in sanitary sewers was studied to determine under what conditions the resulting higher flow capacities can be economically ob-tained. Conservative assumptions were made in this preliminary design and economics study to provide a severe test for the cost effectiveness of provide a severe test for the cost effectiveness of the concept. In many situations, flow smoothing is an attractive alternative when compared to relief pipe installation. Circumstances which favor flow smoothing are high interest rates, high peak-to-average flow rations, low pipe slopes, small diameters, and low design depths of flow. Flow smoothing is strongly favored where earthen construction can be utilized. (Bostian-EPA) W73-10722

APPLICATION OF SELECTED INDUSTRIAL ENGINEERING TECHNIQUES WATER TREATMENT PLANTS, TO WASTE

Hittman Associates, Inc., Columbia, Md.
R. Waller, and C. W. Mallory.
Copy available from GPO Sup Doc as EP1.23/2: Copy available from GPO Sup Doc as EP1.23/2. 73-176, \$2.60; microfiche from NTIS as PB-221 144, \$0.95. Environmental Protection Agency, Technology Series Report EPA-R2-73-176. February 1973, p 226, 19 fig. 13 ref. EPA Project 17090 FYZ. EPA Contract 14-12-946.

Descriptors: *Water Quality Control, Waste water treatment, *Operation and maintenance, Reliabili-ty, Personnel management, *Michigan, *Treatnt facilities

Identifiers: *Flint (Mich), *Industrial Engineering

The applicability of various industrial eng techniques to operation and maintenance of secon-dary waste treatment plants was evaluated. Nu-merous techniques used in military and industrial projects were evaluated and applied in a case projects were evaluated and applied in a case study at the Flint, Michigan, waste treatment plant using actual plant data, practices, and procedures. Emphasis was placed on Work Study and Reliability and Maintainability analysis. A variety of techniques were directly and beneficially applica-ble to the development of rational management programs for design, operation, maintenance, staffing, and quality control. An overall approach to develop complete management programs was developed whereby designers or managers could start from effluent goals and rationally develop designs, O and M procedures, and staffing levels as well as increase plant reliability. Quality control programs are hampered by: poor parameters for measuring effluent quality and process control; lack of knowledge of causes of variability of plant effluent quality as well as the nonsteady state effects of equipment failures; the prevailing practices for setting quality goals, collecting and evaluating performance data; and current practices for enforcement of performance requirements by regulatory agencies. A number of recommendations were offered to develop programs for upgrading waste water plant management. (EPA) W73-10723

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DEWATERING OF MINE DRAINAGE SLUDGE PHASE II,
West Virginia Univ., Morgantown,
D. J. Akera, Jr., and E. A. Moss.
Copy available from GPO Sup Doc as EP1.23/2:
73-169, \$2.10; microfiche from NTIS as PB-221
145, \$0.95. Environmental Protection Agency Technology Series Report EPA-R2-73-169,
February 1973. 152 p, 30 fig, 43 tab, 18 ref. EPA
Project 14010 FJX.

Descriptors: "Acid mine water, "Neutralization, "Sludge treatment, Freezing, "Flocculation, Cen-trifugation, "Dewatering, "Waste water treatment, "Filtration, Filters, Drying, "Mine drainage. Identifiers: Filter aids, Vacuum filtration, Pres-sure filtration, Porous bed filtration.

A study of various acid mine drainage sludge conditioning methods and dewatering systems was made. Acid mine drainage and sludge from neutralization plants were characterized. Four sludges were selected as being representative of the various types of sludges produced by the lime/limestone neutralization of acid mine drainage. The conditioning methods studied were: reezing, use of flocculants, and use of filter aids. The six dewatering systems evaluated were: (1) conventional rotary vacuum filtration, (2) rotary precoat vacuum filtration, (3) pressure filtration, (4) porous bed filtration, (5) thermal spray drying, and (6) centrifugation. No single dewatering system was best for all acid mine drainage sludges. On the basis of cost, the most promising acid mine system was best for an acid mine drainage studges.

On the basis of cost, the most promising acid mine
drainage sludge dewatering techniques appear to
be centrifugation, rotary vacuum filtration and rotary precoat vacuum filtration. (See also W7207101) (Hill-EPA)

FIELD EVALUATION AND DESIGN CONSIDERATIONS OF AEROBIC DIGESTION, Ministry of the Environment, Toronto (Ontario). Research Branch.

N. R. Ahlberg, and A. V. Giffen. Research Report W40, May 1972. 53 p, 1 fig, 7 tab,

Descriptors: *Water pollution control, *Waste water treatment, *Aerobic treatment, *Surveys, *Design criteria, Treatment facilities, Waste water treatment, Oxygen, Temperature, *Sludge digestion, Waste disposal.
Identifiers: Digester capacity.

Presented is a survey of aerobic digesters used to Presented is a survey of aerobic digesters used to stabilize waste sludges from seven water pollution control plants in the Province of Ontario, conducted over an eighteen month period. Air flow rates of 20 cfm/1000 cu. ft. of digester capacity were inadequate for both mixing and oxygen requirements in certain installations. Air flow rate determined on the basis of sludge age and solids concentrations indicate that rates of approximately 50 cfm/1000 cu. ft. of digester capacity are required. To produce a stable sludge, a total sludge age in excess of 120 days is required. To effect sludge concentration and to provide the necessary sludge age, a two stage digester should be provided for all plants except the extended aeration modification of the activated sludge process. The reduction of volatile solids is not a practical indicator of digested sludge stability. Digesting sludge stability is best indicated by the specific oxygen uptake rate; this rate is temperature dependent. Operational problems can result from temperature variations can be minimized by the physical design of the plant. A substantial literature review, field study procedures, a description of treatment facilities, and a discussion of the results are included. [Bell-Cornell)

EFFECT OF A GRASS AND SOIL FILTER ON TUCSON URBAN RUNOFF: A PRELIMINARY EVALUATION, Arizona Water Resources Research Center, Tuc-

son.

B. P. Popkin.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p. 235-261, (1972). 16 fig, 1 tab, 21 ref. OWRR B-023-ARIZ (1).

Descriptors: *Grasses, *Soils, *Urban runoff, *Water quality control, *Treatment, Storm runoff, Lysimeters, Loam, Water sampling, Inorganic compounds, Chemical oxygen demand, Coliforms, Turbidity, Sediments, Leaching, Watershed management, Arizona, Arid lands.

Because storm runoff from the Tucson metropolitan area requires processing for most uses, a grass and soil filter lysimeter was constructed and evaluated as a water-quality treatment facility. The 200x4x5 foot lysimeter contains ment racinty. The 200X4X3 foot systemeter contains homogeneous calcareous ioam covered by common grasses. Less than a cubic foot per second of storm runoff flows by gravity over the lysimeter where surface inflow, surface outflow and subsurface outflow are measured and sampled. Four discrete trials were conducted in the fall of 1971, where water applies were applied for increasing crete trials were conducted in the fall of 1971, where water samples were analyzed for inorganic chemical constituents, chemical oxygen demand (COD), coliforms, turbidity and sediment. Concentrations of COD, coliforms, turbidity and sediment in subsurface-outflow samples decreased significantly during each trial, though early trials showed extensive leaching. Surface-outflow samples had lower turbidity, COD, coliforms and sediment than inflow samples. Turbidity, suspended and volatile solids, coliforms, and COD in runoff samples may be reduced by grass and soil filtraand volatile solids, conforms, and COD in runort samples may be reduced by grass and soil filtration. Grass development and soil settling work to produce a better quality outflow. Quantification of the lysimeter's effectiveness will be useful for urban watershed management in arid lands. (See also W73-10818) (Popkin-Arizona) W73-10835

NITROGEN SPECIES TRANSFORMATIONS OF SEWAGE EFFLUENT RELEASES IN A DESERT

Arizona Water Resources Research Center, Tuc-

son.
P. G. Sebenik, C. B. Cluff, and K. J. DeCook.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 263-275, (1972). 5 fig, 1 tab, 7 ref. OWRR A-022-ARIZ (5).

Descriptors: *Nitrogen cycle, *Sewage effluents, *Ephemeral streams, *Arid lands, *Water pollu-tion, Effluent, Streams, Surface waters, Sewage treatment, Irrigation water, Water sampling, Daily

hydrographs, Nitrification, Stream stablization Rates, Groundwater recharge, Surface-ground water relationships, *Arizona.

water relationships, "Arizona.

Treated sewage effluent is sometimes utilized as a source of irrigation water. This study was made to examine nitrogen species transformations of effluent releases in the channel of an ephemeral stream in southern Arizona. Water samples were taken at locations in sequence so that peak daily flows could be traced as effluent moved downstream. Increased nitrification, coinciding with changing stream characteristics, starts at 6.3 river miles from the Tucson Sewage Treatment Plant discharge. Nitrate-nitrogen values reach a maximum at about 90-95 percent and 60-80 percent of total flow distance for low flows and high flows respectively. The rate of nitrification within sewage effluent releases in a desert stream channel is related to flow distance and physical characteristics of the stream. Once nitrogen loss mechanisms are known, it may be economically fleasible to manage the sewage effluent regime to stimulate increased nitrogen loss, thereby reducing the nitrate-nitrogen concentrations in groundwater recharge. (See also W73-10818) (Popkin-Arizona) W73-10836

EVALUATION OF A TURFGRASS-SOIL SYSTEM TO UTILIZE AND PURIFY MU-NICIPAL WASTE WATER, Arizona Univ., Tucson. Dept. of Soils, Water and

Arizona Univ., Iucson. Dept. of Soils, water and Engineering. R. C. Sidde, and G. V. Johnson. In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p. 277-289, (1972). 1 tab, 12 ref. OWRR A-025-ARIZ (3).

Descriptors: "Turf grasses, "Soil chemical proper-ties, "Waste water treatment, "Sewage effluent, "Nitrogen cycle, Water quality, Water treatment, Inrigation water, Silts, Loam, Soil moisture, Water pollution, Arizona.

pollution, Arizona.

Sewage effluent for irrigation is well established. This study determines the capacity of selective turfgrass-soil systems to purify municipal sewage effluent and to measure the degree of utilization of nitrogen in the effluent by turfgrass, Chlorinated secondarily treated sewage effluent from the city of Tucson was applied to turfgrass grown on sandy loam, silt and loam, under three levels of irrigation under laboratory conditions of duplicate pots. Each pot had 2 suction probes to estimate soil moisture tensions and to allow soil water sampling. The study operated from September to March, 1972, for 30 weeks. Purification efficiency, nitrogen utilization and percent reckarge were calculated. Turfgrass can be irrigated with sewage effluent at common rates without hazard of nitrogen pollution to groundwater. Purification efficiency exceeded 90 percent for all irrigation levels on sandy loam and silt. Nitrogen utilization was greater over sandy loam. Turfgrass-soil systems can utilize nitrogen and purify waste water. (See also W73-10818) (Popkin-Arizona)

CONCEPT EVALUATION: RECOVERY OF FLOATING OIL USING POLYURETHANE FOAM SORBENT, Battelle-Pacific Northwest Labs., Richland, Wash. For primary bibliographic entry see Field 05G. W73-10884

A STUDY OF CILIATE PROTOZOA FROM A SMALL POLLUTED STREAM IN EAST-CE-NTRAL ILLINOIS, Maryland Univ., College Park. Dept. of Zoology.

Group 5D—Waste Treatment Processes

E. B. Small. American Zoology, Vol 13, p 225-230, 1973. 2 fig, 2 tab, 3 ref. OWRR A-024 (7)B-028-ILL (5). 14-01-0001-1081, 14-01-0001-1898.

Descriptors: Waste water treatment, *Protozoa, Biodegradation, *Illinois, *Sewage, *Trickling filters, Filtration, Bacteria, Sessile algae. Identifiers: *Peritrichs.

The role of species of ciliate Protozoa in trickling filter waste treatment processes awaits redefinition. Using the small fresh-water Salt Fork stream a stream which receives all of the discharge from the Champaign-Urbana Waste Treatment Plant in east-central Illinois, analyses of samples of carefully identified ciliates taken from selected sites over a three-year period yielded some interesting results. Four specific situations were noted: (1) rece-swimming microphagous forms feeding selectively on primarily attached bacteria, and, in turn, being fed on by carnivorous ciliates; (2) sessile ciliates (peritrichs) feeding on non-attached bacterial species, but with high selectivity; (3) free-swimming carnivorous gymnostomes feeding on the sessile peritrichs but, again in turn, serving as prey themselves to stalked suctorian species attached to the peduncles of the peritrichs; (4) attached peritrichs and suctorians both serving as food for several groups of small invertebrates are frequenting the stream. With respect to numbers and diversity of ciliates found, some 155 different species, belonging to 93 genera, were identified in the stream and/or the trickling filter settling basin. The highest populations and greatest diversity were found at sites closest to the waste water influx; such protozoan populations might thus be considered as a form of teritary treatment in the drainage basin.

BIOLOGICAL CONDITIONING FOR IM-PROVED SLUDGE FILTERABILITY, Arkansas Univ., Fayetteville. Dept. of Civil En-

D. G. Parker, C. W. Randall, and P. H. King. Journal Water Pollution Control Federation, Vol 44, No 11, p 2066-2077, November 1972. 13 fig, 18 ref. OWRR A-035-VA (8).

Descriptors: *Activated sludge, *Aeration, Chlorination, *Sludge treatment, Storage, Suspended solids, *Waste water treatment, *Filtration.

Identifiers: Filterability (Sludge), Biological conditioning (Sludge).

The effect of commonly used sludge handling procedures and sludge properties on the filterability of activated sludge were studied by using time required to collect 75 ml of filtrate from a 100-ml sludge sample under uniform conditions as a filtration index. Increase of suspended solids concentration in sludge decreased its filterability, as did anaerobic storage and chlorination. However, mild deration at rates sufficient to supply excess dissolved oxygea improved filterability to a maximum at 4 to 6 days of aeration, after which filterability decreased to near its initial value by 2 wk of aeration. Stressing the sludge to the extent that organic carbon was released apparently decreased filterability, whereas biologically active sludge benefited from the aeration. The mechanism of filterability improvement through aeration thus appears to be biologically induced flocculation.

CLOSING THE LOOP ON WASTE WATERS.

Environmental Science and Technology, Vol 6, No 8, p 692-693, 1972. 1 fig.

Descriptors: *Industrial wastes, *Ion exchange, *Fertilizers, *Waste water treatment, Tennessee, Industries, Nitrogen, Ammonia, Resins, North Carolina, Water pollution control, Recycling, Pollution abatement. Identifiers: Fertilizer industry.

Waste water effluents from fertilizer-producing plants is coming under more strict regulatory control, largely because of release of pollutants into waterways. Ion exchange is moving to the forefront as one of the technologies available to handle wastes from actual producing plants. Essential steps in the ion exchange process are collecting of plant waste waters, including runoff, in large settling ponds; filtering through anthracite coal filters to remove particulate matter; contacting waste water with strong acid cation exchange resin that removes the ammonium cation contaminant to less than 3 ppm; contacting the 'decationated' water with a weak base resin in the hydroxide form that removes the anion contaminant to 7-11 ppm nitrate; regenerating cation resin with 22% nitric acid; regenerating anion resin with 7% ammonium hydroxide; combining backwash from each separate unit and neutralizing excess acid with ammonia. Farmers Chemical Association, Inc. calculates that with the ion exchange closed loop system it would produce more than an additional 6000 tons of ammonium nitrate arroducers share. (Jones-Wisconsin) W73-10936

EVALUATION OF COLIFORM TESTS FOR CHLORINATED SECONDARY EFFLUENTS, Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 05A. W73-11002

ENTERIC VIRUS SURVIVAL IN ALGAL-BA-CTERIAL WASTEWATER TREATMENT SYSTEMS-I. LABORATORY STUDIES, California Univ., Berkeley. School of Public Health. M. D. Sobsey, and R. C. Cooper. Water Research, Vol 7, No 5, p 669-685, May 1973. 8 fig. 7 tab, 21 ref.

Descriptors: *Waste water treatment, *Oxidation lagoons, *Biological treatment, Laboratory tests, Bioassay, Sewage effluents, Waste water (Pollution), Cultures, Algae, Bacteria, Suspended solids. Identifiers: *Enterovirus, *Survival, *Scenedesmus quadricauda, *Bacillus megaterium, *Inactivation, Data interpretation, Heterotrophy, Poliovirus, Culture media.

The survival of a representative enteric virus, poliovirus type 1, in laboratory models of algalacterial sewage treatment systems and the interactions of poliovirus with stabilization pond water was studied. In laboratory reactors a fraction of the total poliovirus present rapidly adsorbed to stabilization pond water solids by a reversible process, conforming to a Freundlich adsorption isotherm. In laboratory cultures the growth of Scenedesmus quadricauda and Bacillus megaterium in sterile sewage had no detrimental effect on poliovirus survival, whereas the growth of heterogeneous populations of stabilization pond bacteria in the same medium resulted in substantial virus inactivation. Appreciable poliovirus inactivation occurred in laboratory cultures of mixed algal-bacterial populations obtained from stabilization ponds. Because the degree of antiviral activity in these cultures was greater than that in cultures of stabilization pond bacterial alone, additional microbial factors must contribute to this virus inactivating phenomenon. The results suggest that in algal-bacterial treatment systems both virus adsorption to solids and virus inactivation due to microbial activity play a role in reducing the enteric virus concentration in wastewater. (Holoman-Battelle)

TOXIC EFFECTS OF MERCURY ON THE ACTIVATED SLUDGE PROCESS,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W73-11026

5E. Ultimate Disposal of Wastes

DYNAMICS OF WASTE ACCUMULATION: DISPOSAL VERSUS RECYCLING, For primary bibliographic entry see Field 05G. W73-10739

5F. Water Treatment and Quality Alteration

APPARATUS FOR MONITORING AND CONTROLLING HALOGEN LEVELS IN A WATER TREATMENT SYSTEM, Halogen Controls, Inc., Barrington, Ill. (assignee). D. P. DeVale.

D. P. DeVale. U. S. Patent No. 3,724,474, 5 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 132, April 3, 1973.

Descriptors: *Patents, *Water supply, *Water treatment, Water quality control, *Halogens, Pollution abatement, Water pollution control, Chemical reactions, Waste water treatment.

Identifiers: *Chemical treatment.

An improved method and apparatus are described for measuring and controlling the halogen content of water. A pair of electrodes are placed in the water undergoing treatment. A capacitor is connected across the electrodes. A high input impedance detection circuit is used to determine when the voltage across the capacitor has decreased to a predetermined level and chlorine is added to the predetermined level. The halogen (chlorine usually) content is detected on a continuous fluid flow, dynamically sensed basis. (Sinha-OEIS)

MACHINE FOR REMOVING SEDIMENTARY MATERIAL FROM FILTER BEDS, Gewerkschaft Eisenhuette (West Germany). (as-

signee)
H. Wegmann, K. U. Smula, L. Bartz, and W
Stoltefuss.

U. S. Patent No 3,720,299, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 908, No 2, p 357, March 13, 1973.

Descriptors: "Patents, "Filtration, Water supply, "Sediments, Rivers, Water quality control, Water pollution control, "Water treatment, Water purification, Pollution abatement, "Skimming, "Waste water treatment.

The machine comprises a chassis, means for moving it, and means for skimming an upper layer of material as the chassis moves, and a means for conveying the material from the skimmer. The machine is run on endless tracks. It supports a displaceable front frame carrying an inclined conveyor holding circulated buckets. A rotatable drum with projecting paddles or bars projects material in a trough which feeds the buckets. An inclined plate skims a layer of material from the bed as the machine advances and the drum picks up the material from the plate. Another conveyor extends transversally of the chassis and receives material from the inclined conveyor for subsequent discharge from the machine. (Sinha-OEIS)

WATER-SOFTENING UNIT, National Waterpure Corp., Fallsington, Pa. (assignee)

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S. Bottenanet.
U. S. Patent No 3,719,594, 3 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 172, March 6, 1973.

Descriptors: "Patents, "Water treatment, "Water softening, Water quality control, "Demineralization, "Ion exchange, Resins." (Identifiers: "Regeneration chambers.

This water softening unit comprises a housing hav-ing an ion exchange chamber and a regeneration chamber. The first chamber contains the ion cnameer. The tirst chamber contains the ion exchange resin for softening water. The regeneration chamber is adapted to selectively contain regeneration material for regenerating the resin as accessary. A conduit extends from the top of the ion exchange chamber and is connected by coupling to a spicket positioned outside the housing. A second conduit leads from the bottom of the chamber uwward into the regeneration chamber. ing. A second conduit leads from the bottom of the chamber upward into the regeneration chamber. An important feature of this sytem is the mounting of the regeneration chamber above the ion exchange chamber and the spicket. This permits the water to flow by simple gravity operation. (Sin-ba-OFIS) ha-OEIS) W73-10604

WATER PURIFYING DEVICE,

J. Astu. U.S. Patent No 3,719,593, 5 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 172, March 6, 1973.

Descriptors: *Patents, *Reverse osmosis, *Water purification, Water quality control, *Waste water treatment, *Water treatment.

A reverse osmosis device is used to process feed water under line pressure. The purified water is accumulated in a compressible container and is then led to an outlet. The use of the feed water causes an increased feed water flow through the reverse osmosis device flushing it out. A bleed drain drains off the feed water that is then used to compress the compressible container returning the system to the water purifying and storage condition after delivery of the product water. (Sinha-OEIS) W73-10605

FILTRATION PROCESS FOR CLARIFICA-

TION, Erbara-Inflico Ltd., Tokyo (Japan). (Assignee) Y. Hayashi, and A. Obara. U. S. Patent No 3,719,592, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 171, March 6, 1973.

Descriptors: *Patents, *Filtration, *Coagulation, *Water treatment, *Sedimentation, Turbidity, Waste water treatment.
Identifiers: Aluminum sulfate, *Clarification

The filtration process consists of adding about 3 - 5 ppm aluminum sulfate to suspended water having a turbidity of less than 100 ppm at a time not more than 1 minute before the suspended water is applied to a filter. The rate of filtration is 10 - 40 m/h and during the filtering an additional quantity of aluminum sulfate is added until the filtered water is stabilized. (Sinha-OEIS)

CONCENTRATION OF VIRUS FROM WATER BY ELECTRO-OSMOSIS AND FORCED-FLOW ELECTROPHORESIS: II. IMPROVEMENT OF METHODOLOGY AND APPLICATION TO TAP

WATER,
Gulf South Research Inst., New Orleans, La.
Public Health Science Div.
R. D. Ellender, F. Morton, J. Wheland, and B. H.

Prep Biochem. Vol 2, No 3, p 215-228. 1972. Illus.

Identifiers: *Electro osmosis, *Electrophoresis, Flow, Methodology, Osmosis, *Virus, *Potable water, Water treatment.

water, Water treatment.

The ability of the Canalco Model CF-3 electro-osmosis (EO) apparatus to concentrate viruses from artifically seeded distilled water was improved. Modification of the physical arrangement of the equipment allowed for a 10-25 fold increase in concentration efficiency and a concomitant decrease in the process time. The major improvements involved modifications of the cell arrangement (which increased the membrane transport area), a change in the salt replenishing solution and the use of different membranes of higher flux. Viruses concentrated by EO from seeded tap water resulted in lower recoveries when compared to distilled water. The lower yields were probably due to instability or aggregation of the agents in the menstruum. One could detect viruses at levels as low as 0.01 plaque forming units/ml of initial input. The efficacy of a modification of the Canalco forced flow electrophoretic system was also evaluated. The maximum potential was applied with a constant value for pump rates. A 6-fold concentration of virus and a 12-fold decrease in water volume was obtained. The technique may be applied to the determination of viral flora of natural, processed and recreational waters. (See also W73-0316)—Copyright 1973, Biological Abstracts, Inc. W73-10817

5G. Water Quality Control

THE ORIGIN, EFFECTS AND CONTROL OF TURBIDITY IN AN URBAN RECREATIONAL LAKE, Massachusetts Univ., Amherst, Water Resources

Research Center.
For primary bibliographic entry see Field 05B.
W73-10406

MOBILIZATION AND PARTICIPATION OF CITIZENS GROUPS IN IMPROVING THE QUALITY OF WATER RESOURCES ENVIRON-MENTS, Univ., Minneapolis. Dept. of

Anthropology.
For primary bibliographic entry see Field 06B.
W73-10409

EFFECTS OF MOSQUITO CONTROL DITCHING ON ESTUARINE ECOSYSTEMS, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering. E. J. Kuenzier, and H. L. Marshall. Available from the National Technical Information Service as PB-220 951, \$3.00 in paper copy, \$0.95 in microfiche. North Carolina University Water Reseauers Research Institute Report No.81

Water Resources Research Institute Report No 81, February 1973. 83 p. 15 fig. 14 tab, 49 ref, append. OWRR B-026-NC (1). 14-31-0001-3315.

Descriptors: Environmental effects, Ecology, *Estuarine environment, *Drainage, Mosquitoes, *Ditches, *North Carolina, *Salt marshes, Wet-lands, Marsh management. Identifiers: *Mosquito Control, Estuarine

Large areas of irregularly flooded North Carolina salt marsh dominated by Juncus roemerianus have been ditched in an attempt to control mosquito breeding. Comparative study of ditched and unditched marshes at three locations in N.C. was carried out to determine the extent of ecological changes. Ditches increase the area of aquatic habitat in marshes by a factor of 5, are inhabited bylarge numbers of juvenile fishes, crabs, and shrimp and increase the amount of nursery ground for fish and crustaceans. Animal variety in ditches is low. Oysters planted in the ditches did not grow well. It is unlikely that oysters or shrimp could be

cultured successfully on a commercial basis in ditches. Marshes were flooded 10-28% of the time. Fiddler crabs were present on all marshes. During flood tides fishes occur on both ditched and unditched marshes. Except for the direct effects of the spoil piled on top of the marsh during ditching, large changes were evident in the density and growth of Juncus. Brushy vegetation invaded many spoil piles and along ditches. Invasion continued druing the two year study. Failure of vegetation to significantly cover many spoil piles after eight years, and continuing erosion of spoil piles to form water-retaining levees along ditches is cause for concern. Moratorium on ditching is recommended pending further research on effectiveness for mosquito control and ecological effects. W73-10410

PUBLIC PARTICIPATION IN WILLAMETTE VALLEY ENVIRONMENTAL DECISIONS, Oregon State Univ., Corvallis. Dept. of Anthropology. C. L. Smith. Available from the National Technical Information Service as PB220 953, \$3.00 in paper copy, \$0.95 in microfiche. Oregon Water Resources Research Institute Report WRR-1-15, April 1973. 148 p, 8 fig, 18 tab, 81 ref. OWRR B-023-ORE (2).

Descriptors: *Decision making, Environmental effects, Water pollution control, Social values, *Oregon, Attitudes, *Water quality. Identifiers: *Willamette River (Ore), *Public participation, Interest groups, Lobbying.

ticipation, Interest groups, Lobbying.

In the summer of 1969 the water quality of the Willamette River reached a level suitable for most human and wildlife uses for the first time in nearly 60 years. This water quality enhancement program had been undertaken 30 years earlier when those closely associated with the river were successful in arousing public interest in the deteriorated quality of the river. These two events in the Willamette Valley were not attributable to the urban oriented environmentalists. They were the result of over 30 years of deliberation, debate, and decisions worked out in accordance with the broad variety of self-interests which prevailed among willamette Valley citzens. Self-interest, energized by emotional commitment, was a critical element as groups argued one side or the other of such dilemmas as growth and no growth, management of the environment by man an management by nature, diversity and similarity of actions, elitism and broad participation in decision-making, centralization and decentralization of authority, and generalization and specialization of interests.

IMPREGNATION OF CONCRETE PIPE. Southwest Research Inst., San Antonio, Tex. For primary bibliographic entry see Field 08G. W73-10419

INFLUENCE OF WATER QUALITY IN MAIN-TAINING WHITENESS WHEN LAUNDERING WHITTE FABRICS, North Dakota Univ., Grand Forks. Dept. of Tex-tiles and Clothing. C. M. Janecek. Available from the National Technical Informa-tion Service as PB-220 968, \$3.00 in paper copy, \$0.95 in microfiche. North Dakota Water Resources Research Institute, Fargo, Report WI-221-015, September 1971. 12 p. OWRR A-020-NDAK (3).

Descriptors: *Laundering, *Textiles, *Fabrics, *Testing, Water quality, Effects, Testing procedures, Cotton, Water types, Hardness (Water), Color, Water properties, Water analysis, Organic matter, Water pollution effects, Water softening. Identifiers: Fabric whiteness.

Group 5G-Water Quality Control

The first phase of this study considered how hardness, iron, and manganese affected white cotton test fabric in the laundary process. The second phase was concerned with the effects of organic coloring and minerals on the test fabric. Swatches were prepared from the fabric and laundered by cooperators. The swatches were analyzed in the textile laboratory before laundering and after 1, 5, 10, 15, and 20 launderings. Fabric discoloration and changes in physical properties were considered. Hot and cold water samples were analyzed from each water system. The results of phase one indicated that: there was not a seasonal change in the waters sampled; water conditioning equipment was not functioning properly in a number of cases; fabric laundered in hard waters containing iron and manganese became discolored during the first laundering and the discoloration increased with repeated launderings; and that tensile strength decreased for fabrics laundered in very hard water. In phase two white cotton test fabric was laundered in waters containing organic coloring and minerals, then compared to the same kind of fabric laundered in clear, softened water. Statistically, discoloration was significant, but there was no significant difference in strength loss for the fabrics laundered in the organically colored water. (Woodard-USGS)

DEEP WATER RENEWAL IN SAANICH INLET, AN INTERMITTENTLY ANOXIC BASIN, ngton Univ., Seattle. Dept. of Oceanography,
For primary bibliographic entry see Field 05B.
W73-10432

OILY WATER SEPARATION SYSTEM, Esso Research and Engineering Co., Florham Park, N.J.

Park, N.J.
R. J. Skocypec.
Available from the National Technical Information Service as COM-72-10561, \$4.50 in paper copy, \$0.95 in microfiche. Final Report No. EEZTMR.72, January 1972. 54 p, 18 fig, 20 tab, 2 append. Project No. Task II, Sub-Task 3. Contract No. C-1-35049.

Descriptors: *Oily water, *Separation techniques *Filtration, Oil, Oil wastes, Water pollution con-

Identifiers: *Ballast water, Performance evalua-tion, Esso coalescer, Cuno filter, Oil removal, Par-ticulate matter.

An oily water separation system for marine use consisting of an AMF-Cuno Super Auto-Klean Filter (Model AK-511) upstream of an Esso Coalescer was evaluated. The Cuno-Filter was evaluated as a unit for particulate removal while the Esso Coalescer was evaluated as an oil removal device. The system's effectiveness was highly inconsistent due to plugging of the coalescer by wax. The best performances achieved were with two coalescers in series downstream of a surge tank for gross oil removal. Oil removal efficiencies were near 90 percent for these tests over a wide range of influent oil contents. The Cuno-Filter was unsuccessful in removing particulates in this application. However, it should be noted that the Cuno filter was not specifically designed for this application. General specifically designed for this application. General application of this type of coalescer where a highly polished effluent is desired is discouraged for dirty polished effluent is desired is discouraged for dirty ballast water treating because of wax plugging which makes the coalescer inoperative. The coalescer is, however, recommended for removing oils with known low wax contents. Plugging due to suspended solids is not thought to be significant. (Little-Battelle) W73-10535

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME Office of Water Resources Research, Washington,

For primary bibliographic entry see Field 05B. W73-10556

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME

Office of Water Resources Research, Washington, D.C. For primary bibliographic entry see Field 05B. W73-10557

NITRATE REDUCTION IN THE VICINITY OF TILE DRAINS, Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.

W73-10560

THE ECONOMIC EFFECTS OF PAW-TUCKAWAY STATE PARK: V. EFFECT OF PARK USE ON ENVIRONMENTAL QUALITY, New Hampshire Univ., Durham. Water Resources Research Center. For primary bibliographic entry see Field 05C. W73-10562

INTERNATIONAL CO-OPERATION FOR POL-

LUTION CONTROL, United Nations Inst. for Training and Research, D. Serwer.

In: Law, Institutions, and the Global Environ-ment. Oceana Publications, Inc., Dobbs Ferry, New York. p 178-207. 1972.

Descriptors: "Water pollution control, "Air pollution, "Land management, "International law, "Technology, "Standards, "Costs, Regulation, Permits, Compensation, Planning, Forecasting, Identifiers: "Liability, "Registration, "Licensing,

International means of controlling pollution of land, sea, and air are described. Protection, discharge, and technological standards, complete prohibitions, effluent charges, and price adjustpromonuous, ettiuent charges, and price adjust-ments are discussed. Measures promoting com-pliance include liability, registration, licensing, technical assistance, subsidies, compensation, planning, and forecasting. (Ensign-PAI) W73-10566

INTERNATIONAL ENVIRONMENTAL CON-TROLS IN THE SCIENTIFIC AGE, Columbia Univ., New York, Inst. for the Study of

In: Law, Institutions, and the Global Environment. Oceana Publications, Inc., Dobbs Ferry, New York. p 208-236. 1972, 56 ref.

Descriptors: *Environmental control, *Interna-tional law, *Management, Technology, *Research, Data collections, Data transmission,

The roles of science and technology in interna tional environmental management are discussed. Efforts to create new global norms and institutions for environmental control by slow traditional means cannot be relied upon as primary mechanisms for environmental management un-less they are accompanied by decisive international responses to environmental issues on re-gional and bilateral levels. The use of global institutions is compared to that of more fragmented systems, and collection and dissemination of data and economics are considered. Experience derived from international management of the oceans is reviewed. (Ensign-PAI) THE IMCO EXPERIENCE,

Intergovernmental Maritime Consultative Organization, London (England). Legal Div. T. A. Mensah.

In: Law, Institutions, and the Global Environ-ment. Oceana Publications, Inc., Dobbs Ferry, New York. p 237-252. 1972. 8 ref.

Descriptors: *Oceans, *Water pollution control, *International law, Water pollution, Air pollution, Land management, Ships, Oil spills, Pollutants, Organizations, Legal aspects.

The activities of the Inter-Governmental Maritime Consultative Organization (IMCO) related to prevention of marine pollution are summarized. IMCO is concerned with contamination of the sea, IMCO is concerned with contamination of the sea, land, and air by ships and other equipment operating in the marine environment, and it is particularly interested in preventing spills of oil and other noxious substances. The institutional and legal frameworks of the organization are described, and operative bodies within the organization are discussed, including the Maritime Safety and Legal committees. (Ensign-PAI) W73-10568. Legal comm W73-10568

THE POTENTIAL OF REGIONAL ORGANIZATIONS IN MANAGING MAN'S ENVIRONMENT,

Woodrow Wilson International Center for Scholars, Washington, D.C. R. E. Stein.

In: Law, Institutions, and the Global Environ-ment. Oceana Publications, Inc., Dobbs Ferry, New York. p 253-293. 1972. 143 ref.

Descriptors: *Environmental control, *Internaional waters, "Governments, Inter-agency cooperation, Management, Organizations, Inter-national Joint Commission. Identifiers: Regional-Global organizational rela-

A description is given of the study, catalyst, and management functions of various intergovernmenmanagement functions of various intergovernmental organizations dealing with international environmental problems. The ways in which agencies deal with oil pollution of the oceans are explained along with the activities of the International Joint Commission. The relationship of regional organizations to global organizations is explored. (Ensign-PAI) W73-10569

PROCEEDINGS OF THE 1971 OSTAC ANNUAL MEETING, STATE DEPARTMENT, WASHING-TON, D.C. 2-3 JUNE 1971.

National Security Industrial Association, Washington, D.C. 266 p, 1971.

Descriptors: *Environmental control, Programs, Descriptors: "Environmental control, Programs, "Federal government, "State Governments, "Lo-cal governments, Natural resources, Protection, Mapping, Charts, Water pollution, Air pollution, Water quality, Pollution abatement, Coasts, Management, Ships, Operations, Industries, Fish-ing, Oil, Chemicals, Mining, Recreation.

Federal, state, and regional programs concerned with the marine environment were described at the 1971 annual meeting of the ocean science and Technology Advisory Committee. These include rechnology Advisory Committee. These include programs on ocean resource protection; mapping, charting, and geodesy; environmental prediction and atmospheric services; pollution prevention; air pollution; water quality; coastal zone management; and ship operations. In addition, the current status of the chemical, fishing, petroleum, marine recreation, and marine mining industries is discussed. (See W73-10571 thru W73-10578) (En-

DEPARTMENT OF INTERIOR PROGRAM, Bureau of Outdoor Recreation, Washington, D.C. C. D. Hofe, Jr.

In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p II-28-II-35, 1971.

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Descriptors: United States, *Federal government, *Coasts, *Estuaries, *Management, *Resources development, Programs, Wildlife, Fisheries, Regulations, Waste disposal, Dredging, Land fills, Recreation, Water quality, Circulation, Hydrology, Water pollution control, Mining, Exploitation, Oil, Operations.
Identifiers: *Department of Interior.

Coastal zone management and resource development programs of the Dept. of the Interior are discussed. The National Park Service administers 4 coastal zone areas, and the Bureau of Sport Pisheries and Wildlife conducts studies designed to improve anadromous fish populations. In addition, the Bureau operates fish hatcheries and has National Wildlife Refuges located in estuaries and no coastal islands. The Bureau also reviews applications for permits to dredge, fill and to discharge refuse in navigable waters. The Bureau of Outdoor Recreation is concerned with the development of refuse in navigable waters. The Bureau of Outdoor Recreation is concerned with the development of coastal areas for recreation purposes, and the Geological Survey carries out research on water quality, circulation, hydrology, and pollution contol. The Survey also maps continental margins and performs geologic and geophysical surveys. The Bureau of Land Management is concerned with the development of marine mineral resources, oil and gas leasing, and the environmental impact of mineral exploitation. The Bureau of Mines deals with offshore petroleum operations as well as dredging activities. (See also W73-10570) (Ensign-PAI) (Ensign-PAI)

FEDERAL INTERACTION WITH STATES,

Virginia Inst. of Marine Sciences, Gloucester Point.

W.J. Hargis, Jr.
In: Proceedings, 1971 OSTAC Annual Meeting,
National Security Industrial Association,
Washington, D.C. p III-1 - III-10, 1971.

Descriptors: *Coasts, *Planning, *Management, Federal government, State governments, Local governments, *Governmental interrealtions, *Resources development, *Water quality, Zoning, Easements, Taxes, Permits, Licenses, Leases, Standards.

The development of a national coastal zone mangement program is proposed in order to preserve the quality of the oceans. Effective management of man's activities, ingress and egress, offloading and onloading, and transfer from international to interstate commerce would permit control of the resources and quality of the seas and coastal zones. A variety of complex management techniques should be used rather than a control model approach. Land planning and management, zoning, easements, tax relief, user than a control model approach. Land planning and management, zoning, easements, tax relief, user permits, and dredging and filling licenses are sug-gested, along with fishery and mineral leasing, water uses and discharge permits, and water quali-ty standards. There should be state and local in-volvement in the federal program, and all efforts should be coordinated. (See also W73-10570) (En-sign-PAD. sign-PAI) W73-10572

LONG ISLAND'S APPROACH TO ENVIRON-

MENTAL QUALITY,
Ocean Systems, Inc., Reston, Va.
E. C. Stephan.
In: Proceedings, 1971 OSTAC Annual Meeting,
National Security Industrial Association,
Washington, D.C. p III-13 - III-17, 1971.

Descriptors: *Sounds, *Water quality control, Research, *Oceanography, Waste disposal, *Wetlands, *Management, Dredging, Landfill, Standards, Industry, Agriculture, Waste water disposal, Waste water treatment, Technology, Thermal pollution, Ecology, *New York. Identifiers: *Long Island.

Actions taken by the Nassau-Suffolk Regional Planning Board to preserve and enhance the quality of Long Island's marine environment are discussed. Oceanographic research has been carried out, along with studies on waste water disposal and groundwater replenishment; wetland management; dredging and dredge spoil placement; and beach stabilization and replenishment. Development of effluent standards for municipalities, industry, and agriculture is suggested, along with development of baselines to establish the extent of man's alteration of the environment and creation of sound waste water treatment and disposal technology. In addition, increased understanding of wetlands and their role in ecology and of thermal pollution from power plants is needed. (See also W73-10570) (Ensign-PAI) W73-10573

DELAWARE MARINE RELATED STUDY, Hercules, Inc., Wilmington, Del. R. W. Cairns.

In: Proceedings 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p III-18 - III-24, 1971.

Descriptors: *Delaware, *Coasts, *Seawater, *Water quality control, Projects Development, Construction, Regulations, Permits, Legislation, Management, State governments.

Identifiers: Public hearings, Prohibition measures.

Recommendations for ways to preserve and im-prove the quality of Delaware's marine and coastal environments are discussed. Environmental imenvironments are discussed. Environmental impact statements and public hearings on all major development projects in the coastal zone are suggested, along with prohibition of industrial development along the shoreline and building of deep water ports. In addition, a moratorium on permits for piers, docks, and structures that would intrude on the coastline is proposed, and more permanent coastal zone legislation is suggested. The possibility of centralizing management and responsibilities in the state is explored. (See also W73-10570) (Ensign-PAD) W73-10570) (Ensign-PAI) W73-10574

THE GULF ENVIRONMENTAL PROGRAM, Gulf Universities Research Corp., Galveston, Tex.

J. M. Sharp.
In: Proceedings, 1971 OSTAC Annual Meeting,
National Security Industrial Association,
Washington, D.C. p III-25 - III-41, 1971.

Descriptors: *Gulf of Mexico, *Continental shelf, *Coasts, Research, Energy, Geochemistry, Trace elements, Oil, Pesticides, Organic matter, Chemical analysis, Sedimentation, Mineralogy, Biology, Synoptic analysis, Management, Economics, Water quality control.

Identifiers: *Barataria Bay, *Subsystem interrela

Environmental properties and processes, chief flows of energy mass, and momentums, and prin-cipal activities of man in five subsystems of the Gulf of Mexico are considered. These subsystems include coastal and continental shelf areas of the include coastal and continental sheft areas of the NE, N central, NW, and southern parts of the Gulf and the open Gulf which interconnects the four coastal/continental shelf subsystems. Direct interaction and interdependence of these subsystems is recognized. Synoptic investigations in Barataria Bay are described; these include geochemical, trace element, hydrocarbon, pesticide, and organic chemical analysis, along with determinations of mineral content, sediment tex-ture and structure, and biology. Coastal zone management and economics are also considered. (See also W73-10570) (Ensign-PAI)

REPORT OF STUDY ON SHIPS CHANNELS
AND HARBORS,
American Association of Port Authorities,
Washington, D.C.
A. Hammon.
In: Proceedings, 1971 OSTAC Annual Meeting,
National Security Industrial Association,
Washington, D.C. p III-49 - III-51, 1971.

Descriptors: "Atlantic Ocean, "Coasts, "Maine, "New Jersey, "Delaware, "Harbors, Facilities, Ships, Water pollution, Recreation, Cities, Pollu-tion abatement, Cleaning, Protection. Identifiers: Supertankers, "Port facilities.

Development of public, deepwater port facilities for supertankers carrying petroleum is discussed, with emphasis on the North Atlantic. Private supertanker terminal plans off northern Maine, and New Jersey, and in Delaware Bay have run into considerable local resistance because of the fear of oil pollution. The coastinie is well developed for recreational and residential uses and also serves as a fishing ground. Supertanker transshipment terminals and vessels must offer the utmost in pollution prevention and oil containment and removal equipment, along with financial protection to surrounding shore communities. (See also W73-10576) (Ensign-PAI)

CALIFORNIA'S MARINE PROGRAM, Modern Management, Beverly Hills, Calif. J. J. Moore.

In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p III-53 - III-66, 1971.

Descriptors: *California, *Coasts, *Protection, *Management, *Legialation, Resources, Economics, Technology, Administration, Research and development, Water pollution con-

Coastal zone management programs undertaken in California are discussed, along with legislation for protecting California's marine and coastal environments. Economics of ocean resource development, demographic pressures within the coastal zone, environmental concerns, disenchantent with technology, and loss of confidence in administrative officials have encouraged legislation. Regional commissions for coastal zone management have been suggested, along with a moratorium on all coastal development until 1975. (See also W73-10570) (Ensign-PAI) W73-10570) W73-10577

CHEMICAL PANEL REPORT, Union Carbide Corp., New York. J. S. Whitaker.

In: Proceedings, 1971 OSTAC Annual Meeting, National Security Industrial Association, Washington, D.C. p IV-9 - IV-16, 1971.

Descriptors: *Chemical industry, *Chemical wastes, *Waste disposal, Oceans, Land, Air, Hazards, *Water pollution control, Control systems, Protection, Equipment, Materials, Treatment facilities, Programs, Research and development, Transportation, Education.

Efforts made by the chemical industry to reduce the quality of its wastes and to make other wastes more acceptable to the receiving environment, particularly ocean and coastal areas, are discussed. The chemical industry needs the ocean

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as a receptor for its toxic wastes which create greater hazards when disposed to land, air, or surface waters; however, the industry is opposed to indiscriminate dumping. The industry has changed raw materials, improved catalysts, changed starting and intermediate materials, altered equipment, and substituted one product for another. Terminal treatment with conventional hardware has also been employed. In addition to treating facilities, the industry has environmental protective research and development programs. An environmental hazard center which dispenses information on emergencies arising during transport and handling of chemicals is being established, and educational programs have been created. (See also W73-10370) (Ensign-PAI) W73-10578

OCEAN UTILIZATION AND COASTAL ZONE DEVELOPMENT.
Massachusetts Inst. of Tech., Cambridge. Sea
Grant Project Office. For primary bibliographic entry see Field 02L.
W73-10579

POLLUTION OF THE MARINE ENVIRON-MENT AND THE EFFECTS THEREFROM: THE CASE FOR STRICTER ENFORCEMENT, York Univ., Downsview (Ontario). Faculty of En-For primary bibliographic entry see Field 05C.

METHOD OF DECONTAMINATING AN OR-GANOPHOSPHORUS INSECTICIDE, Department of the Air Force, Washington, D.C.

U. S. Patent No. 3,725, 269, 2 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 315, April 3, 1973.

Descriptors: *Patents, *Insecticides, *Organophosphorus pesticides, Water pollution control, Water quality control, Chemical reactions, *Solvents, *Pollution abatement.

The method of decontaminating an organophosphorus insecticide comprises two steps. (1) Exposing the insecticide in a volume-to-volume ratio of ten parts of decontaminant to one part in-secticide. The decontaminant being 12.5% - 25% by volume of monoethanolamine in dipropylene glycol monomethyl ether as a solvent. (2) The ex-posure is continued for at least 30 minutes. (Sinha-OEIS) W73-10583

CONTROL OF OIL POLLUTION AT SEA, AP-PARATUS AND METHOD,

A. J. Ortiz. U. S. Patent No. 3,724,662, 10 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 909, No 1, p 178, April 3, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Leakage, *Seepage control, Oceans, Water quality control, Water pollution control, Equipment, *Pol-lution abatement.

The control of a leak or spill of oil is accomplished by the use of a huge plastic bag. The bag is of an inverted tear-drop shape with its small end serving as its mouth. The large end is closed except for hose connections for removal of accumulated oil to be transferred to a reservoir. Oil flows from the to be transferred to a reservoir. Oil flows from the source into the bag and is pumped to the reservoir. The plastic bag is rolled from its pre-folded position and is pulled underwater by frogmen. Once the mouth has been positioned and anchored, the seal at the throat is released and oil is then allowed to flow into the body of the bag. (Sinha-OEIS) W73-10591

FLOATING FIRE EXTINGUISHING AP-PARATUS AND CATCH BASIN, R. J. Chiasson, R. G. Bourg, and T. J. Arceneaux. U. S. Patent No. 3,724,555, 3 p, 4 fig, 2 ref; Offi-cial Gazett of the United States Patent Office, Vol 909, No 1, p 151, April 3, 1973.

Descriptors: *Patents, *Oil pollution, *Oil spills, Equipment, *Pollution abatement, Water quality control, Water pollution control. Identifiers: *Fire extinguishers, Oil rig fires.

A floating fire extinguishing apparatus and catch basin smother offshore oil rig fires and prevent oil pollution. The apparatus is a U-shaped hull which can be manipulated to enclose a burning rig and smother the fire. Pumps mounted on the structure spray water over the burning rig to assist in putting out the fire and cool the rig. Interconnected pressure relief vents are provided to relieve internal pressures. An annular space defined by the enclosing structure in the water provides a catch basin for the containment of the liquid hydrocarbon liquids. (Sinha-OEIS)

METHOD FOR SEPARATING OIL FROM

METHOD FOR SEPARATING OIL FROM WATER SURFACE, Ocean Design Engineering Corp., Long Beach, Calif. (assignee). R. E. Hunter. U. S. Patent No. 3,723,307, 3 p, 3 fig, 6 ref; Offi-cial Gazette of the United States Patent Office, Vol 908, No 4, p 1115, March 27, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Water quality control, Water pollution control, *Pollution abattement. Identifiers: *Wave action, Foam material.

Small buoyant bodies of flexible foam material are distributed over the oil floating on the surface of the water. The foam material is lifted and compressed to remove the oil and then returned to be used again. Booms are used for gathering the bodies of foam material toward a conveyor which lifts the material upward. The booms are articulated and include floats so that the booms rise and fall with wave action. (Sinha-OEIS) Small buoyant bodies of flexible foam material are

APPARATUS FOR SKIMMING OIL. Gulf Oil Corp., Pittsburgh, Pa. (assignee). R Stenstro

U. S. Patent No. 3,722,690, 4 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 970, March 27, 1973.

Descriptors: *Patents, *Oil pollution, *Oil spills, Equipment, Water quality control, Water pollution control, *Pollution abatement, *Skimming. Identifiers: *Oil skimmers.

This collapsible flotation buoy is intended for skimming an oil layer from water in a tanker so ballast water will not pollute ocean water. The buoy is provided with mechanical folding arms for collapsing the buoy, permitting its insertion into a narrow opening at the top of the tank. The folding arms are remotely controlled to permit expansion of the buoy for use when it is inside the tank. (Sinha-OEIS)

SEA-SURFACE OIL EXTRACTOR. Reynolds Submarine Services Corp., Miami, Fla. (assignee).

R. F. Wirschi U. S. Patent No. 3,722,688, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 969, March 27, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Skimming, Equipment, Water quality control, Water pollution control, *Pollution abatement. Identifiers: *Oil skimmers. This oil skimmer carries its own ballast. A flexible skirt is used to form the wall of a sump compartment surrounding the ballast chamber. There is a weir arrangement by means of which the apparatus skims the contents of the surface of the sea. A pump within the sump compartment helps remove the surface layer while the cleaned water is led out from the lower region of the compartment. (See also W73-10598) (Sinha-OEIS) W73-10597

APPARATUS FOR EXTRACTING OIL OR THE LIKE FROM THE SURFACE OF THE SEA, Reynolds Submarine Services Corp., Miami, Fla.

A. L. Markel, and R. F. Wirsching. M. L. Market, and K. P. Wirsching. U. S. Patent No. 3,722,689, 4 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 908, No 4, p 969, March 27, 1973.

Descriptors: *Patents, *Skimming, *Oil spills, Oil pollution, Equipment, Water quality control, Water pollution control, *Pollution abatement, *Weirs.
Identifiers: *Oil skimmer:

This invention uses a self-compensating weir arrangement disclosed in the copending application of R. F. Wirsching. The sump compartment is made sufficiently large so as to obtain deceleration of the flow of liquids which pass over the weir member. Vanes are used to generate a vortex within the sump compartment. The latter is made large enough so that a quiescent condition is obtained for the liquids therein. Oil obtained from the inner weir is pumped to a collecting vessel. (Sas inner weir is pumped to a collecting vessel. (See also W73-10597) (Sinha-OEIS)

FLOATING OIL SKIMMING APPARATUS WITH OIL AND WATER SEPARATOR, G. B. Stebbins, J. F. Stebbins, and J. G. Becker. U. S. Patent No. 3,722,687, 5 p., 6 fig. 10 ref; Offi-cial Gazette of the United States Patent Office, Vol 908, No 4, p 969, March 27, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Skimming, *Pollution abatement, Equipment, Water quality control, Water pollution control. Identifiers: *Oil skimmers.

A novel floating oil skimmer continuously removes a floating oil and water mixture from the surface of a body of water and conditions the mixture for easy separation. The platform has a flat upper surface and an upstanding peripheral weir at its outer edge. The mixture flows over the weir toward the center of the platform where a second toward the center of the platform where a second weir surrounds a sump. There is a centrifugal pump in the center of the sump. It aerates the mixture and transfers it to the top of a separating tank. Air and water rise while water at the bottom of the tank is continuously removed. (Sinha-OEIS)

OIL SPILLAGE DETECTION SYSTEM, Durham Associates, Inc, Lynnfield, Mass. (as-

R. H. Daniels, and J. G. Zahka. U. S. Patent No 3,719,936, 5 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 908, No 1, p 246, March 6, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water quality control, *Pollution abatement, Water quality Water pollution control, Equipment. Identifiers: *Oil sensors, Sensing.

A housing is adapted to be placed in a partially submerged buoyant state in a body of water. It has one or more input ports to permit entry of water and any oil which may be on the surface of the water. A selectively transmissive member is provided within the housing in a position exposed to the oil-water interface and operates to transmit the

oil. A sensor in one chamber within the housing detects the presence of oil. The sensor may be a resistance temperature dependent electrical thermometer or the sensor can be mechanically actuable by the weight of oil within the chamber to cause an output indication. The oil chamber can be removable for collection purposes. The system can also include a means for releasing a coalescing agent which combines with oil to provide for easier removal. A marking material can also be released to visually mark the spillage site. (Sinha-OEIS) OEIS)

CONSTRAINTS IN WATER MANAGEMENT ON AGRICULTURAL LANDS, Colorado State Univ., Fort Collins. Dept. of Economics.

For primary bibliographic entry see Field 03F.

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ESTABLISHING PRIORITIES IN MINE DRAINAGE REDUCTION, A COST-EFFECTIV-ENESS APPROACH, Corps of Engineers, Baltimore, Md. Planning Div.

University of Educators of States of

Descriptors: Water resources, Planning, *Water pollution control, *Acid mine water, Drainage, Watersheds (Basins), Methodology, Cost allocation, Streams, New York, Pennsylvania, Estimating, Optimization, Cost-benefit ratio, Lime, Neutralization, Water quality, Water supply, Systems analysis, Mathematical models, *Cost analysis, *Mine drainage. Identifiers: *Cost-effectiveness, Cost minimization, *Susquehanna River basin, *Tioga River (Pa).

Twenty-seven watersheds in Susquehanna River Basin territory are severely degraded by acid mine drainage pollution. Approximately 620 miles of significant tributaries as well as 230 miles of prin-cipal rivers are either sterile or intermittently cipal rivers are either sterile or intermittently degraded by acid slugs. As a result of acid discharges, many uses of the streams, such as water supply and recreation, are rendered ineffectual. In past attempts at acid mine drainage abatement, programs did not look beyond the immediate problem area; no considerations were given to the blending effect of natural alkalinity in other streams. Since abatement of acid mine drainage pollution is extremely costly, a method of minimizing these costs has been devised. The systematic, cost-effectiveness approach is discussed. A case study of the Tioga River (Pa) is presented, and a mathematical model developed by the Baltimore District Corps of Engineers to optimize the system of abatement measures under by the Baltimore District Corps of Engineers to optimize the system of abatement measures under objectives of improving water quality in the defined Tioga River reaches is described. By using the systematic, cost-effectiveness approach, water resources planners can control the allocation of funds for maximizing the abatement of acid mine drainage. (Bell-Cornell)

GRAPHS FOR CINCINNATI, OHIO, Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 02B. W73-10679 DEVELOPMENT OF DESIGN STORM HYETO-

OIL ON PUGET SOUND, AN INTERDISCIPLI-NARY STUDY IN SYSTEMS ENGINEERING, Washington Univ., Seattle. Coll. of Engineering. For primary bibliographic entry see Field 05B. W73-1068

WATER QUALITY MANAGEMENT PLAN, IN-TERIM ST. CROIX RIVER BASIN. Creative Research Services. Inc.

Prepared for Division of Water Quality, Min-nesota Pollution Control Agency, St. Paul, 1971. 103 p, 5 fig, 20 tab, append.

Descriptors: "Planning, "Water quality control, Waste water treatment, Water quality standards, Environmental effects, "Minnesota, Treatment facilities."

Identifiers: *Water quality management plan, *St.

Croix River Basin (Minn).

This report is one in a series of ten river basin, water quality management plans for the State of Minnesota. These plans represent a significant element in the state's river basin planning capabilities and are intended to meet federal requirements for construction grants for municipal wastewater treatment plants. The report defines the improvement needs for municipal wastewater treatment for the period 1971 to 1980. The main areas of discussion are (1) a description of the river basin including geography, economic activities, and population; (2) information on the water resources of the basin including surface and groundwater, water supplies, and water use; (3) information on water quality with emphasis on stream standards and effluent standards; (4) tables of principal effluent sources; (5) the effects of the effluent discharges on water quality in the basin; (6) and evaluation and priority ranking of treatment needs; and (7) an interim pollution abatement plant including objectives, sewer and treatment plant needs, cost estimates, implementation measures, and probable environmental impact. (Elfers-North Carolina) W73-10689

EVALUATION OF THE OHIO WATER SUPPLY PROGRAM: SUMMARY.
Environmental Protection Agency, Chicago, Ill.

Div. of Air and Water Progra

Available from the National Technical Informa-tion Service as PB-214 058, \$3.00 in paper copy, \$0.95 in microfiche. July, 1972. 19 p, 2 fig.

Descriptors: "Water supply, "Evaluation, Quality control, Inspection, Regulation, Monitoring, Ad-ministrative agencies, "Ohio, "Potable water. Identifiers: Ohio Public Water Supply Program.

An evaluation of the Ohio Public Water Supply An evaluation of the Ohio Public Water Supply Program in terms of its ability to provide safe, wholesome drinking water deals primarily with state activities related to the regulation and sur-veillance of community water supplies. The study found that established standards of good practice were not being universally met in the state. For exwere not being universally met in the state. For example, many water supply systems were either not meeting drinking water standards, not keeping good records, or not being inspected by state regulatory agencies. State agencies, such as the Department of Health, were generally limited in staff and money and were reductant to issue orders to correct local deficiencies. It is concluded that Ohio correct local deficiencies. It is concluded that Ohio must expand and improve its community water supply program. Specific recommendations include an increased budget and professional staff for surveillance activities, the implementation of annula sanitary surveys of each community water supply, monthly reports from treatment plant operators, the use of automatic data processing techniques, and the creation of new state regulation. (Elfers-North Carolina) W73-10692

TOWN OF CAIRO WATER SUPPLY REPORT. Diachishn (A.) and Associates. For primary bibliographic entry see Field 03D. W73-10693

WELL OPERATION, Madison Water Utility, Wis. For primary bibliographic entry see Field 08A. W73-1071.

THE FEASIBILITY OF FLOW SMOOTHING STATIONS IN MUNICIPAL SEWAGE THE FEASIBILITY OF FLOW SMOOTH STATIONS IN MUNICIPAL SEW/ SYSTEMS, Research Triangle Inst., Durham, N.C. For primary bibliographic entry see Field 05D. W73-10722

APPLICATION OF SELECTED INDUSTRIAL ENGINERRING TECHNIQUES TO WASTE WATER TREATMENT PLANTS, Hitman Associates, inc., Columbia, Md. For primary bibliographic entry see Field 05D. W73-10723

WHAT IS THE ROLE OF FLOOD FLOWS IN THE POLLUTION OF THE CONNECTICUT RIVER AND ITS AMELIORATION, Massachusetts Univ., Amherst. For primary bibliographic entry see Field 05B. W73-10731

SALINITY PROBLEMS OF IMPOUNDMENTS AND THEIR MANAGEMENT, Agricultural Research Service Chickasha, Okla. Soil and Water Conservation Research Div. H. B. Pionke, and O. D. Workman. In: Great Plains Agricultural Council Publication No. 60, Control of Agricultural-Related Pollution in the Great Plains, Seminar, July 24-25, 1972, Lin-coln, Nebraska, p 155-167, 6 fig, 5 ref.

Descriptors: *Impoundments, *Water quality, Salinity, *Water management, Routing, Reservoir operation, Diversion, *Great Plains. Identifiers: *Salinization hazard, *Inflow classifiation for the property of the property of

Impoundment can cause the salinization of retained or outflow waters, particularly in areas characterized by low rainfall and high evaporation rates as exist in parts of the Great Plains. The realistic control of the salinization associated with impoundment depends on the proper classification of the hazard. Areas classed according to high or low hazard have or require few management options. Those classified as low-hazard could sustain considerable change in salinity without affecting the continued or projected use of the impounded and outflow waters. Conversely, the projected salinity of waters associated with areas classified as hazardous could severely limit or prohibit their use. Where the salinization potential is intermediate, the problem may be managed to minimize a salinity increase without greatly modifying or precluding impoundment. Some of the techniques considered include preferential routing of inflow waters, minor design modifications, relocation of the structure, and the use of evaporation retardants to minimize salinity increase. (ARS).

CSS: A COMPUTER PROGRAM FOR MODEL-ING ECOLOGICAL SYSTEMS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 06A. W73-10736

DYNAMICS OF WASTE ACCUMULATION: DISPOSAL VERSUS RECYCLING, V. L. Smith. The Quarterly Journal of Economics, Vol 86, No 4, p 600-616, November 1972. 5 fig, 15 equ, 11 ref.

Descriptors: "Water pollution control, "Pollution abatement, "Waste disposal, "Recycling, "Pollution taxes (Charges), Economics, Litter, Equations, Model studies, Constraints, Costs, Prices. Identifiers: "Environmental quality, Scrap value.

Group 5G—Water Quality Control

A simple control model of the economics of waste recycling is presented. Pollution, litter, or waste disposal is assumed to enter the economic system as a public bad in household utility functions. The disposal is assumed to enter the economic system as a public bad in household utility functions. The resulting subjective cost of using the environment for discharge is not borne directly by those whose decisions result in environmental degradation. The optimal control solution requires a price to be associated with waste discharge, depending upon the accumulated stock of waste, the interest rate, and the rate at which waste decomposes in nature. A competitive decentralized economy is generated by the model when the waste discharge price is identically zero. This corresponds to an unapby the model when the waste discharge price is identically zero. This corresponds to an unappropriated environment available to all as a free resource for waste discharge. The control solution and the decentralized competitive solution approach the same stationary state equilibrium in two special cases, involving: (1) High private recycling costs; and (2) low private recycling costs; and (2) low private recycling costs; and the private recycling costs. To economists, the natural control device is a Pigouvian system of user charges. Some of the features of a Senate bill designed to institute pollution charges on packaging materials also are discussed. (Bell-Cornell) W73-10739

PRICING OF POLLUTION: THE COASE THEOREM IN THE LONG RUN, California Univ., Los Angeles; and National Center for Health Services Research and Development, Rockville, Md. H. E. Frech, III.

The Bell Journal of Economics and Management Science, Vol 4, No 1, p 316-319, Spring 1973. 8 ref.

Descriptors: "Pollution abatement, "Pollution taxes (Charges), "Industries, Basins, Resource allocation, Market value, Profit, Water pollution, Air pollution, "Cost analysis.

Identifiers: "Coase Theorem.

In an earlier article in this Journal, R. A. Tybout in an earlier article in this Journal, K. A. Tybout attempted a refutation of the long run applicability of the Coase Theorem. He argued that even in a zero transaction costs model, bribery to reduce pollution and compensation charges for it result in different total profits, and thus in different longdifferent total profits, and thus in different long-run behavior. This paper demonstrates that Tybout's result is based on a fundamental error in the analysis of costs for the polluting and polluted industries. The property right to the polluted (air or water) basin is a valuable asset with a definite market value. When the rent of this valuable asset is properly included in the costs of the industry holding the right, marginal and total profits are shown to be identical regardless of the assignment of the basin ownership. (See also W72-13559) (Beli-Cornell) W73-10740

THE SPOILS OF PROGRESS: ENVIRONMENTAL POLLUTION IN THE SOVIET UNION,

TAL POLLUTION IN THE SOVERS CARGON, M. I. Goldman.
M.I.T. Press: Cambridge, Mass., ; London, England. 1972. 372 p. Illus. Maps. Pr. \$7.95.
Identifiers: Aral Sea, Books, Caspian Sea, *Environmental effects, Lakes, Laws, Pollution, Sea, *USSR, Lake Baikal.

Abuses are described of water, air, land and raw materials in Russia, analyzing the forces that ha brought about the current situation and describi brought about the current situation and describing both the drawbacks and advantages of state control and conservation. Chapters are included on the theory and law of environmental protection in the socialist state and the economic and political propensity to pollute. The effects of Soviet urbanization, industrialization and growing technological prowess on the natural resources of the country are considered in detail. Case studies of how Lake Baikal and the Caspian and Aral Seas was explained for geongic purposes to the detriwere exploited for economic purposes to the detri-ment of the environment are included. Finally, the genuine advantages of the Soviet system are ex-amined along with some of the implications of

no reason to believe that state ownership of the means of production will necessarily guarantee the elimination of environmental disruption.—Copyright 1972, Biological Abstracts, Inc.

COST ANALYSIS OF WATER POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY, Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.

D.C. Office of Research and Montoring.
D. P. Tihansky.
Copy available from GPO Sup Doc as
EPI.23/3:73-017, \$3.95; microfiche from NTIS as
PB-221 146, \$0.95. Environmental Protection
Agency, Socioeconomic Environmental Studies
Report, EPA-R5-73-017, April 1973. EPA Project
01-AAB-01. Program Element H11094.

Descriptors: *Bibliographies, *Cost Analysis, *Costs, *Water Pollution Control, *Abstracts, Cost comparisons, *Cost-benefit analysis,

This annotated bibliography is a compilation of the literature on water pollution control costs. It contains nearly 2,000 selected publications, unpublished papers, and theses focusing on the time period from 1960 to 1972, although earlier material is added if it seems particularly relevant. The references are chosen to satisfy the needs and interests of several twose of researchers. For several twose of researchers. For the property of the several twose of researchers. For the property of the several twose of researchers. For the property of the prope terests of several types of researchers. For the economist, there are books and articles on economic theory and incentive systems in water economic theory and incentive systems in water quality management. For the engineer, there is in-formation on unit treatment processes and cost im-plications of their design and operation. For the operations research analyst, optimization techniques, mathematical modeling, and statistical techniques, mathematical modeling, and statistical methods are referenced as they apply to waste water control. For the policy maker, cost function literature identifies the primary determinants of cost and their quantitative effects. Political and socio-economic issues are also related to water pollution control. (EPA) W73-10879

INVESTIGATION OF USE OF GEL MATERIAL FOR MINE SEALING, Dravo Corp., Pittsburgh, Pa.

Dravo Corp., Pittsourgn, Pa.
N.K. Chung.
Copy available from GPO Sup Doc as
EP1.23/2:72-135, \$1.25; microfiche from NTIS as
PB-221 247, \$0.95. Environmental Protection
Agency, Technology Series Report EPA-R2-72135, December 1972. 67 p, 27 fig, 11 tab. EPA Project 14010 EKW.

Descriptors: *Acid mine water, *Mine drainage, Abatement, *Sealants, *Gels, Water pollution control. Identifiers: *Chemical grouts, *Mine sealing.

Laboratory testing of commercially available chemical grouts was conducted to evaluate their potential use, in conjunction with a cheap filler, for remote sealing of mine voids. By close control of the setting time and proper distribution of the grout slurry it was believed that a mine seal could be placed through a borehole from the surface without the benefit of retaining bulkheads. A slurry mix consisting of an acrylamide grout with flyash or mine refuse as a filler was found to produce a strong controllable gel which resisted chemical attack in the laboratory over an eleven week exposure period. An attempt to demonstrate a novel technique for application of the selected grout slurry in a mine entry with high flow was not a novel technique for application of the selected grout slurry in a mine entry with high flow was not successful. The results suggest that the technique may be applicable in dry or low flow situations. However, the estimated cost of a mine seal using the gel material is presently not competitive with existing methods. Groundwater monitor wells were drilled for the purpose of determining the effect of mine sealing on groundwater conditions. Data reflecting pre-seal conditions were compiled, be because the sealing of the mine was not complete the monitoring program has been postponed

CORRELATED STUDIES OF VANCOUVER LAKE - WATER QUALITY PREDICTION STU-

DY, manigton State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-10882

A SEARCH: NEW TECHNOLOGY FOR PAVE-MENT SNOW AND ICE CONTROL, Abt Associates, Inc., Cambridge, Mac

MENT SNOW AND ICE CONTROL,
Abt Associates, Inc., Cambridge, Mass.
D. M. Murray, and M. R. Eigerman.
Copy available from GPO Sup Doc as
EP1.23/2-72-125, \$1.00; microfiche from NTIS as
PB-221 250, \$0.95. Environmental Protection
Agency, Technology Series Report EPA-R2-72125, December 1972. 54 p, 5 fig. 3 tab, 65 ref. EPA
Project Z-800615. Contract No. 68-01-0706.

Descriptors: Water pollution control, Cost-benefit analysis, *Ice, *Snow removal, Snow manage-ment, Roads, Equipment, *Deicers, *Heating, Cost analysis, *Highway icing. Identifiers: *Snow plows.

A study was undertaken to search for new approaches to the problem of snow removal and ice control. Proven techniques of technology transfer were applied for the purpose of identifying technologies that have not yet been utilized for decing purposes. Contracts with specialists and a 'brainstorming session' were used to determine 'brainstorming session' were used to determine strategies for search of computerized data banks. Although several approaches were identified, none are immediately useable. Results indicate that: (1) More information is needed on salt damage to the environment, highway structures, and vehicles in order to perform accurate cost-benefit analyses of alternative approaches. (2) More complete knowledge is needed on the effects of alternate chemical deicers. (3) Pavement heating is an expensive means of removine snow and of alternate chemical deicers. (3) Pavement heating is an expensive means of removing snow and ice but can be justified in special cases for safety or environmental reasons. (4) Two mechanical devices, snow plow with compressed air and a brush and blower system require further testing and development. (5) Research is required to identify a hydrophobic substance which can be applied to pavement to reduce ice adhesion. A brief cost estimate of the various approaches has been included. (EPA) W73-10883

CONCEPT EVALUATION: RECOVERY OF FLOATING OIL USING POLYURETHANE FOAM SORBENT, Battelle-Pacific Northwest Labs., Richland,

Wash.
C.H. Henager, and J. D. Smith.
Copy available from GPO Sup Doc as
EP1.23/2:72-049, \$1.50; microfiche from NTIS as
PB-221 251, \$0.95. Environmental Protection
Agency, Technology Series Report EPA-R2-72049, September 1972. 97 p, 29 fig, 6 tab, 7 ref. EPA
Project 15080 HEU. Contract 68-01-0070.

Descriptors: Evaluation, *Oily water, *Separation techniques, Technical Feasibility, Efficiencies, Hydraulic systems, Hydrodynamics, Jets, Testing, Water Pollution Treatment, *Oil spills, Oil pollution, Oilwater interfaces.
Identifiers: *Sorbents, *Polyurethane foams,
Equipment development, *Oil recovery.

Individual components of an oil spill recovery system were evaluated using Bunker C oil and three crude oils ranging in API gravity from 14 degrees to 42 degrees. The system was designed to

Techniques of Planning—Group 6A

shred and broadcast polyurthane foam sorbent onto an oil slick, herd the sorbent to a shipside onto an oil suca, nerti the sorbent to a snipside conveyor by a water spray boom, squeeze the sorbent to extract the oil and rebroadcast the sorbent. The initial concept was to build a half-size, full scale system; however, initial foam losses indicated the necessity for a re-evaluation of the program, and specific studies on the broadcasting program, and specific studies on the broadcasting and 'squeezing' systems were undertaken. The shredder-broadcaster, a commercial straw mulcher, produced acceptable shredding of dry foam. However, multiple cycling degraded oil-soaked foam to unrecoverable sizes in relatively few cycles. With Bunker C oil, 47 percent of the foam was reduced to size less than 1/2' in 5 cycles. foam was reduced to sizes less than 1/2' in 5 cy-cles. With light Canadian crude oil, 29 percent was uced to less than 1/2' in 100 cycles. A sorbentreduced to less than 1/2' in 100 cycles. A sorbeni-oil separator using perforated rolls, was designed to extract viscous oils from the foam at 20C, without heating, at rates of up to 5000 gph. This device showed good recovery of oil from foam. Multiple cycling of Bunker C-oil-soaked foam through the full scale device resulted in a small through the full scale device resulted in a small loss of foam by size reduction (3.5 percent in 77 cycles). After 77 cycles of extracting Bunker C oil, foam damage by loss of resiliency reduced oil extraction per cycle to about 25 percent of the initial amount. No loss of resiliency was observed up to about 50 cycles. Because of the high sorbent losses in the shredder-broadcaster, the systems as initially proposed is not recommended for use with Bunker C oil. (EPA) W73-10884

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OPTIMAL FEEDBACK CONTROL - A SYNOP-

SIS, Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 07C.
W73-10887

UNRECORDED POLLUTION SOURCES AND OPTIMUM WATER QUALITY SYSTEMS, Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst. For primary bibliographic entry see Field 05B. W73-10889

06. WATER RESOURCES **PLANNING**

6A. Techniques of Planning

SYNTHESIS AND EVALUATION OF URBAN-R-EGIONAL HYDROLOGIC RAINFALL-RUNOFF CRITERIA, Environmental Dynamics, Inc., Los Angeles,

For primary bibliographic entry see Field 02A. W73-10416

METHODOLOGICAL IMPROVEMENTS IN MEASURING ECONOMIC EFFECTS OF MUL-TIPURPOSE WATER RESOURCE PROJECTS. Berger (Louis), Inc., East Orange, N.J. For primary bibliographic entry see Field 06B. W73-10417

(CALIFORNIA COMPREHENSIVE OCEAN AREA PLAN). APPENDIX I: PERMANENT COASTAL ZONE DATA INVENTORY AND IN-FORMATION SYSTEM, California State Dept. of Navigation and Ocean Development, Sacramento. For primary bibliographic entry see Field 07C. W73-10552

VALUES AND COST ALLOCATIONS OF SUR-VALUES AND TREATMENT,
New Hampshire Univ., Durham. Agricultural Experiment Station.
For primary bibliographic entry see Field 06B.
W73-10558

A «SEQUENTIAL DECISION APPROACH IN RECREATIONAL ANALYSIS, Maryland Univ., College Park. Dept of Civil Engineering.
For primary bibliographic entry see Field 06B.
W73-10619

A PREDICTIVE MODEL FOR UPPER RIO-- GRANDE INDEX FLOWS, Colorado Div. of Water Resources, Denver. For primary bibliographic entry see Field 04A. W73-10620

THE DEVELOPMENT OF A PLAN OF STUDY-AN INTERAGENCY APPROACH TO MULTIOBJECTIVE PLANNING AND EVALUATION OF WATER AND LAND RESOURCE USE, Resource Economics Div.

R. B. McKusick, J. M. Kress, P. G. Ashton, and

W. A. Bunter, Jr.

Water Resources Bulletin, Vol 9, No 3, p 467-484, June 1973. 2 fig, 14 ref.

Descriptors: Water resources, "Comprehensive planning, "Alternative planning, Evaluation, "Linear programming, "Inter-agency cooperation, Optimization, Systems analysis, Mathematical models, Natural resources, "Resource allocation, Land use, Demand, Regional development, Agriculture, Forestry, Recreation, Water utilization, Multiple purpose. Identifiers: "Multidisciplinary approach, Environmental quality, National economic development.

Presented is a systems approach evaluating alternative plans for resource use incorporating the concepts of multiobjective planning and evaluation (MOPE). The need for multidisciplinary input and strong interagency cooperation in planning for resource use is related to the logical and orderly completion of the planning steps. MOPE is described briefly, emphasizing two important concepts: (1) The relationship of the study problems and objectives to national social objectives; and (2) the display of alternative solutions showing tradeoffs. Several important characteristics of a plan of study which implements MOPE are presented and discussed. A proposed MOPE analytical system is divided into eight interdepent subsystems that describe data collection, use, analysis, and results. A linear programming model dent subsystems that describe data collection, use, analysis, and results. A linear programming model is presented that analyzes the present and future demand relationships for natural resources. The model will also evaluate the interaction of agriculture, forestry, and recreation with the resource base of the basin, considering National Economic Development, Environmental Quality, and Regional Development. (Bell-Cornell)

COMPUTER SIMULATION OF RECREA-TIONAL BOATING ACTIVITIES, Army Engineer District, Chicago, Ill. Economics Branch. A. L. Dietz.

Water Resources Bulletin, Vol 9, No 3, p 494-498, June 1973.

Descriptors: "Simulation analysis, "Computer models, Harbors, "Lake Michigan, "Boating, "Recreation demand, Alternative Evaluation, Probability, Methodology, Systems analysis, Mathematical models.

Identifiers: *Harbor improvement, Travel behavior, Transient, Refuge, Small boat harbors, Predicting.

Lake Michigan provides the necessary conditions for reducing the region's outdoor recreational locating supply deficiency. However, the presence of the Lake itself is not sufficient to solve the deficiency problem because use is strictly controlled by a limited number of access points. A solution is selected site expansion to not only provide access but also service the refuge and transient needs. Harbor improvement planning which identifies the refuge and transient service needs at points along Lake Michigan is considered. The travel behavior model developed to predict this use is sensitive to five criteria: boater characteristics which influence travel behavior; entry rates into the Lake from each access site; site characteristics; weather conditions; and planning parameters. The model estimates: the number of boaters demanding a given access point at a given time; length of stay at that point; probability of travel to specific access sites in given amounts of time; and those facilities used during a specified time period. The simulation modelling boat movement consists of two parts: a traffic generation routine and an activity simulation. The former schedules the entry of boats into the Lake from each site and the latter establishes the probabilistic movement of boats on the Lake. This simulation of interport movements and port activities enables the planner to investigate some impacts of alternative small boat harbor development plans. (Bell-Cornell)

ESTABLISHING PRIORITIES IN MINE DRAINAGE REDUCTION, A COST-EFFECTIV-ENESS APPROACH, Corps of Engineers, Baltimore, Md. Planning Div. For primary bibliographic entry see Field 05G. W73-10624

A BUDGETING AND LINEAR PROGRAMMING ANALYSIS OF IRRIGATION WATER VALUES IN NORTHERN WYOMING, Wyoming Univ., Laramie. Dept. of Agricultural Economics. For primary bibliographic entry see Field 03F. W73-10699

W.A.L.R.U.S. I WATER AND LAND RESOURCE UTILIZATION SIMULATION, Michigan Univ., Ann Arbor. School of Natural

Michigan Univ., Anni Fasto.

A. G. Feldt, D. Moses, and J. Eckroad.

Available from the National Technical Information Service as COM-72-10811, \$3.00 in paper copy, \$0.95 in microfiche. Sea Grant Program, Technical Report No. 28, The University of Michigan, May, 1972. 69 p. 3 fig, 6 tab, 1 ref.

Descriptors: "Simulation analysis, "Computer programs, "Computer models, "Planning, Water resources, "Land use, "Water users, Environment, Governments, Communication, Economic aspects, Public lands, Public utilities, Sewers, Pollutants, Model studies, Operations research. Identifiers: "Gaming-simulation.

Presented is WALRUS I, the first in a series of three games developed to provide a basis for communication and interaction among Sea Grant personnel engaged in specialized water resources research and between such personnel and the lay public they are seeking to serve. Successive models in the series will provide gaming-simulation models of increasing complexity and highly sophisticated and realistic simulation of human communities and their interrelationships with the environment. This first game in the series is necesarily quite crude. In a sense, WALRUS I is more of a questionnaire than a simulation model in that it was primarily designed to ask whether or not the

Field 06-WATER RESOURCES PLANNING

Group 6A—Techniques of Planning

kinds of factors contained within its framework were the appropriate ones to be considered in deal-ing with local efforts at water resources planning. The answer has been a qualified 'yes' from a con-The answer has been a qualified 'yes' from a considerable range of persons who have played the initial forms of the model. WALRUS I has proved satisfactory for its basic purposes and to introduce many persons to the use of gaming-simulation models. However, the game is best understood by playing it. (Bell-Cornell) W73-10735

CSS: A COMPUTER PROGRAM FOR MODEL-ING ECOLOGICAL SYSTEMS, Oak Ridge National Lab., Tenn.

Available from the National Technical Informa-tion Service as ORNL-1BP-71-5, \$3.00 in paper copy, \$0.95 in microfiche. ORNL-1BP-71-5, Aug 1971. 96 p., 5 fig. 13 tab, 7 ref., 3 appen.

Descriptors: "Digital computers, "Computer programs, "Ecology, "Ecosystems, "Simulation analysis, Model studies, Equations, Data collections. Identifiers: Storage components, Flow functions, Compartment models, Time factor, Dynamic

Two major objectives in the analysis of ecosystems are: (1) Basic research into the mechanisms of ecosystem processes; and (2) prediction of effects of perturbations on the ecosystem and its components. Modeling can be useful in attaining these goals by introducing consistency and order to individual process studies and by allowing the researcher to view the implications of particular hypotheses in terms of the behavior of the overall system. CSS is a digital computer program developed to allow ecologists with minimal training in mathematics and computer programming to construct and test a wide puter programming to construct and test a wide variety of ecosystem models. A CSS model is a set of simultaneous differential equations. Nonlinear and time-dependent functions are permitted for transfers between storage components; however, the models must be predominantly continuous. Sources and sinks may be defined. Concepts cources and staks may be defined. Concepts necessary for program use are discussed, including preparation of program input and interpretation of program outputs. Two test cases and a listing of the program are provided. (Bell-Cornell) W73-10736

COMPARATIVE STUDY OF RESOURCE ANALYSIS METHODS, Harvard Univ., Cambridge, Mass. Dept. of Land-

Harvard Univ., Cambridge, mass scape Architecture.

T. Murray, D. Sinton, D. Way, and C. Steinitz.

Available from the National Technical Information Service as AD-751 299, \$6.00 in paper copy, \$0.95 in microfiche. August 1969, 369 p, 176 fig, 3

tab, 73 ref, 11 appen.

Descriptors: *Resources, *Analysis, *Data collections, Documentation, *Computer programs, *Land use, Planning, Surveys, Evaluation, Water resources, Model studies, Systems analysis, Rivers, Watersheds (Basins), *Massachusetts. Identifiers: *Boston (Mass.), Charles River Identifie

The need for resource policies which minimize the inevitable conflicts among the various demands for land calls for precise analytic and predictive methods for effective land use planning. A comparative analysis of current significant approaches to resource analysis by selected individuals and course its presented. Describe they substantial to resource analysis by selected individuals and groups is presented. Despite the substantial amount of good work being done in resource analysis, a common failing in this field is a lack of documentation. Descriptions of the approaches are applied to a model for data inventory which can then be used as a basis for comparing the method descriptions. The model, relies heavily on computer use and is detailed in section II of this study. Section III describes the selected approaches, including: Their methodological goals; constraints under which the method was developed or under which it operates; data variables which are investigated; logic of the analytic approach; the applicability of the method to other areas, scales, and purposes; and its principal documentation. The method of comparison used is to abstract the logic of the approach and apply it to the common base of data bank describing the Boston Southwest Sector. Section IV is a comparative discussion of the efficacy of these methods. (Bell-Cornell). W73-10737

6B. Evaluation Process

AN ECONOMIC MODEL OF AN AREA'S RESPONSE TO DEPLETION OF ITS WATER

Kansas Water Resources Research Inst., Manhat-

For primary bibliographic entry see Field 04B. W73-10405

MOBILIZATION AND PARTICIPATION OF CITIZENS GROUPS IN IMPROVING THE QUALITY OF WATER RESOURCES ENVIRON-

Univ., Minneapolis, Dept. of Minnesota Anthropology. L. P. Gerlach.

L.F. Germen. Available from the National Technical Informa-tion Service as PB-220 964, \$3.00 in paper copy, \$0.95 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 57. April 1973. 16 p, 6 ref. OWRR B-031-MINN (1). 14-31-0001-

Descriptors: Ecology, Environment, Environmental effects, Water resources, "Social participation, 'Social values, Attitudes, Motivation, Social change, Organizations. Identifiers: "Ecology movement, "Environmental issues, Ideology.

The ecology movement has the same general characteristics of segmentary, polycentric, late organization as such other movements late organization as such other movements as the Black Power Movement and the Pentecostal Movement. The diverse groups concerned with en-vironmental issues can be arranged on a con-tinuum from established and routinized to new and radical. These groups proliferated rapidly from about 1969-1972. The ecology movement functions as a whole because of the way its different segas a whole because of the way its different seg-ments interweave in a network. There is con-siderable overlap between ecology groups and various 'counter-culture' segments. Recruitment to ecology groups is characteristically through face-to-face contact instead of via large scale ad-vertising. Commitment to the ecology movement was not accomplished as dramatically as with Black Power or Pentecostalism. The opposition to the ecology movement was real and often power-ful but environmentalists often perceived it to be more sinister and powerful than was the case. Common ideology concepts of the ecology move-ment are: doomsday theme, share guilt for en-vironmental degradation, finite resources leading to a zero sum game, closed system and spaceship earth, need for recycling, need to control or limit growth, ecosystem and interdependence, need for significant change, and system change means lifestyle change. significant char lifestyle change. W73-10409

PUBLIC PARTICIPATION IN WILLAMETTE VALLEY ENVIRONMENTAL DECISIONS, Oregon State Univ., Corvallis. Dept. of

Oregon State Univ.,
Anthropology.
For primary bibliographic entry see Field 05G.

LOCAL ECONOMIC IMPACT OF RESERVOIR

RECREATION,
Tennessee Univ., Knoxville. Dept. of Economics.
C. B. Garrison.

C. B. Garrison.
Center for Business and Economic Research,
Water Resources Research Center, Tennessee
University, Research Report No. 27, July, 1972. 37
p, 15 tab, append. OWRR A-020-TENN (2). 14-310001-3543.

Descriptors: "Economic impact, "Income analysis, Water resources development, "Tennessee, "Rural areas, "Recreation, Reservoirs. Identifiers: Multiplier effect, Primary impact, Secondary impact, "Norris Reservoir (Tenn), Local income multiplier.

Reservoir recreation affects the economy of the local area and also the larger region in which the reservoir is located. Using Norris Lake reservoir in east Tennessee as an example, the local impact of reservoir recreation activities on the surrounding rural area was studied. The impact was decomposed into (a) the primary and (b) the secondary effect. The primary effect included employment and payroll of enterprises which sell goods and services directly to recreation users. As of 1967, direct earnings of those employed in recreation-based enterprises accounted for less than two percent of the area's total personal income. The secondary impact, defined as the multiplier effects of the primary impact, were found to be small. The present study also compared the local economic impacts of utilizing a reservoir for recreation with those of establishing water-intensive manufacturing industry. The impact of water-intensive industry was found to be significantly greater than that of recreation development. (Weaver-Wisconsin) W73-10415 of recreatio W73-10415

METHODOLOGICAL IMPROVEMENTS IN MEASURING ECONOMIC EFFECTS OF MUL-TIPURPOSE WATER RESOURCE PROJECTS.

Available from the National Technical Informa-tion Service as PB-220 966, \$4.85 in paper copy, \$0.95 in microfiche. Completion Report, March 30, 1973. 79 p, 6 fig, 31 tab, 58 ref. OWRR C-3068 (3731) (1).

Descriptors: *Economic impacts, *Benefit-cost analysis, Benefit-cost ratios, Benefit-cost theory, Beneficial use, *Multiple-purpose reservoirs, Water supply, Benefits, *Multiple-purpose rojects, Power, Recreation, Conservation, Municipal water, Industrial water, Agricultural economics, Plood control, Irrigation, *California. Identifiers: Pine Flat Dam, Santa Maria Project, Trinity Project, Tulare Lake, Land enhancement, Twitchell Dam, Payment capacity.

The purpose was to analyze the methods currently used in the evaluation of the benefits and costs of multipurpose water resource projects, to recomend changes to these methods and to develop new ones which will improve these evaluations. new ones which will improve these evaluations. The study was carried out by analyzing three completed multipurpose water projects: the Pine Flat Dam and Reservoir near Fresno, the Santa Maria Aroject near Santa Maria, and the Trinity River Division of the Central Valley Project near Redding (all in California). This group includes projects developed for providing flood protection, supplies of irrigation water, municipal and industrial water supplies, hydroelectric power, fish and wildlife habitats, and recreation. The study basically followed the structure of a benefit-cost analysis of the projects. Particular attention was paid to many environmental impacts which were imysis of the projects. Farucular attention was paid to many environmental impacts which were im-properly treated in the original plans for develop-ment. The principal recommendation to improve water project evaluation is the extension of analy-sis beyond the fundamental benefit-cost analysis to include many crucial impacts which are not quantifiable in monetary terms. W73-10417

VALUES AND COST ALLOCATIONS OF SURFACE-WATER USE AND TREATMENT, New Hampshire Univ., Durham. Agricultural Ex-periment Station.

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periment Station.
R. A. Andrews, and R. R. Weyrick.
Available from the National Technical Informa-tion Service as PB-221 103, \$4.85 in paper copy, \$0.95 in microfiche. Publication No 500, 1972. 89 p., 7 fig., 25 tab, 9 ref. 4 append. OWRR C-1713 (No 3160) (1).

Descriptors: *Economic impact, Economics, *Linear programming, *Cost allocation, *New Hampshire, *Implied benefits, Resources, Evaluation, Water utilization, Model studies, River basin

development. Identifiers: Resource use sensitivity, *Resource

allocation.

A linear programming model for a river basin was developed to include almost all water related conomic activity both for consumers and producers. The model was so designed that the entire basin or basin subdivision could be analyzed. The model included seven sectors, more than nine objective function criteria, three river flow levels, two river water quality classifications and projections of population to 1980. Economic basis for conflicts among sectors over incidence of cost allocation and level of economic activity can be traced to some chosen objective. The imputed variable cost for median river flow level of 'B' class for approximately current economic activity and minimizing cost was 12 cents per pound of BOD. This cost increased to 14.6 cents when population was projected to 1980. Sensitivity analysis indicated that the optimal level of resource allocation was quite stable at each flow level. Lake shoreline was the dominant feature determining lake resource valuation. Implied capital value varied from 126 dollars per foot to over 250 dollars depending on discount rate. Imputed prices on lake surface ranged from 42 dollars to 147 dollars an acre depending on location and discount rate. Strong economic forces encouraged small lot sizes for vacation cottages. for vacation cottages. W73-10558

AN ECONOMIC EVALUATION OF A WATER-BASED URBAN TOURIST ATTRACTION IN SAN ANTONIO, TEXAS, TEXAS A and M Univ., College Station. Water Resources Inst.
W. L. Trock, and R. D. Lacewell.
Available from the National Technical Information Service as PB-221 024, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report 48, April 1973, 131 p. 92 tab, 11 ref. OWRR B-103-TEX (1). 14-31-0001-3653.

Descriptors: "Economic impact, River basin development, "Urban sociology, "Evaluation, "Texas, Tourism, City planning, Attitudes, Social aspects, Recreation. Identifiers: "San Antonio (Texas), "Paseo del Rio

The purpose is to determine the economic effect of the Paseo del Rio on commercial enterprises and activities as it affects tourism and recreation in the central city. Based on the assumption that the economic effects of the developed river area arise from the expenditures of the users, and that beneficiaries are the businesses surrounding the area, three surveys have been conducted. One concerned users of the developed river area. It served to identify their socio-economic characteristics and other relevant factors which might be important to their knowledge and use of the river. The second was a survey of the businesses in the central business district to identify their economic characteristics, their relationship to the Paseo del Rio, and the proportions of gross receipts of these businesses attributable to the developed river area. A third survey served to identify characteristics of residents of San Antonio, their knowledge of the Paseo del Rio and their use of it for various purposes. (Runkles-Tex A and M)

W73-10564

A SEQUENTIAL DECISION APPROACH IN RECREATIONAL ANALYSIS, Maryland Univ., College Park. Dept of Civil En-

R. H. McCuen.

Water Resources Bulletin, Vol 9, No 2, p 219-230, April 1973. 6 tab, 4 equ, 11 ref.

Descriptors: "Recreation facilities, "Benefits, Demand, "Estimating, "Decision making, "Indiana, Water resources, Projects, Costs, Operation and maintenance, Statistical methods, Equations,

water resources, Projects, Costs, Operation and maintenance, Statistical methods, Equations, Reservoirs, Risks. Identifiers: Economic analysis, Sensitivity analy-sis, White River, Bloomfield (Ind), *Bayesian decision analysis, Visitation rates, Water-based recreation, *Sequential decision theory, Empirical prediction equations.

Benefits from recreation facilities can be estimated by multiplying the estimated number of user-days by an administratively determined dollar value per user-day. Such a method requires accurate estimates of total visitation to a proposed facility. The use of sequential decision theory for estimating recreation visitation rates is demonstrated. Bayesian decision analysis provides a convenient statistical framework in which estimates of recreation visitation using different methods can be combined to provide a more accurate estimate than that obtained from a single source. The Bayesian framework also provides a means of determining the optimal (with respect to a preselected cost function) number of interviews that should be conducted in the primary market area. The procedure is demonstrated for a hypothetical recreation site in southern Indiana. Actual census data for 1970 is used with empirical prediction equations to estimate visitation rates for the hypothetical site. The empirical estimates and visitation rates observed at existing facilities were used to establish a prior probability distribution for visitation to the proposed recreation facilities. The methodology of revising the initial probability distribution according to the results of user interviews is demonstrated. The effects of uncertainty involved in estimating visitation rates are assessed using sensitivity analysis. (Bell-Cornell)

THE DEVELOPMENT OF A PLAN OF STUDY-AN INTERAGENCY APPROACH TO MULTIOBJECTIVE PLANNING AND EVALUATION OF WATER AND LAND RESOURCE USE, Economic Research Service, Davis. Natural Resource Economics Div. For primary bibliographic entry see Field 06A. W73-10622

COMPUTER SIMULATION OF RECREA-TIONAL BOATING ACTIVITIES, Army Engineer District, Chicago, Ill. Economics

For primary bibliographic entry see Field 06A. W73-10623

ESTABLISHING PRIORITIES IN MINE DRAINAGE REDUCTION, A COST-EFFECTIV-ENESS APPROACH, Corps of Engineers, Baltimore, Md. Planning Div. For primary bibliographic entry see Field 05G. W73-10624

SOCIAL AND ECONOMIC IMPLICATIONS OF PROPOSALS FOR OUT-OF-BASIN RIVER DIVERSIONS.

Massachusetts Univ., Amherst. Water Resources Research Center.

B. B. Berger.

Journal of Professional Activities, Proceedings of the American Society of Civil Engineers, Vol 97,

No PP1, p 95-110, October, 1971. 1 fig, 2 tab, 12 ref, 1 append.

Descriptors: "Environmental effects, "Social participation, "Diversion, "Inter-basin transfers, Social aspects, Flood flow, Fish, Nutrients, Estuaries, Groundwater recharge, "Connecticut River, "Massachusetts.
Identifiers: Citizens Review Committees, Quabbin Reservoir, Boston Metropolitan area.

Reservoir, Boston Metropolitan area.

The need for water resource planners and engineers to focus more attention on the ecologic and social aspects of their projects and proposals is discussed. The example used is the proposal to divert flood waters from the Connecticut River to the Quabbin Reservoir which is the major source of water supply for the Boston metropolitan area. Because of the drought of 1962-1966 and the increasing demands for water the reservoir is operating at about 50% of its capacity. However, the diversion proposal has met strong opposition, particularly on environmental and social issues. With the new environmental concern in this country and the passage of the National Environmental Protection Act it is not enough to simply consider engineering and economic aspects of projects. Thus, in relation to water diversions such factors as fish populations, nutrients, wastewater dilution, estuarine processes, and groundwater recharge must be studied. Also it is very important to incorporate constructive public involvement in the planning process. Clitzens review committees are being effectively used in New England where a broad spectrum of water uses have been investigated. Support of proposed action programs by concerned citizens well may have a greater influence on public policy and decisions on water resources development in the future. (Elfers-North Carolina) W73-10688

WATER QUALITY MANAGEMENT PLAN, IN-TERIM ST. CROIX RIVER BASIN. Creative Research Services, Inc. For primary bibliographic entry see Field 05G. W73-10689

POTENTIALS FOR A DELAWARE DEEP-WATER PORT. Gladstone Associates, Washington, D.C. For primary bibliographic entry see Field 03E. W73-10690

EVALUATION OF THE OHIO WATER SUPPLY PROGRAM: SUMMARY.
Environmental Protection Agency, Chicago, Ill.
Div. of Air and Water Programs.
For primary bibliographic entry see Field 05G.
W73-10692

TOWN OF CAIRO WATER SUPPLY REPORT. Diachishn (A.) and Associates.
For primary bibliographic entry see Field 03D.
W73-10693

AN ANNOTATED OUTLINE OF A WATER-RESOURCES DEVELOPMENT PLAN FOR ALABAMA, Geological Survey of Alabama, University. H. C. Barksdale.

H. C. Barksdale.

Available from the National Technical Information Service as PB-213 698, \$3.00 in paper copy, \$0.95 in microfiche. Prepared for Alabama Development Office, Office of State Planning, Montgomery, February, 1971, Revised August 1971. Report No. ALA-GSA-X996-WRC-71-4. 23 p. WRC-71.

Descriptors: "Planning, "Water resources development, Conservation, Water supply, En-vironmental effects, Water demand, Institutions, "Alabama, "Management, Flood plains.

Field 06-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

Identifiers: Flood plain management.

Identifiers: Flood plain management.

This short report is a general prospectus for a water resource development plan for the State of Alabama. It is felt that a water resource development plan should be an integral part of overall state planning as water is closely related to the economic and social growth and well-being of the state. The report stresses both the development and the conservation of water resources and sees conservation as a key element of a development plan. Some of the uses of water that the plan will include are domestic supply, industry, agriculture, power, fish and wildlife, waste disposal, recreation, and environmental enhancement. The prospectus also emphasizes flood-plain management and the need for more data and research in such areas as current water use, future water needs, coastal zone areas, urban hydrology, new reservoir sites, water rights, and institutional arrangements. (Elfers-North Carolina)

ASSESSMENT OF GEOTHERMAL ENERGY RESOURCES. Department of the Interior, Washington, D.C. Panel on Geothermal Energy Resources.

Report prepared for the Committee on Energy Research and Development Goals, Federal Coun-cil for Science and Technology, September 1972. 84 p, 2 tab, 2 fig, 114 refs.

Descriptors: "Geothermal studies, "Energy, "Natural resources, "Assessments, "Water supply, Mineral water, Economic impact, Steam, Hotsprings, Electrical studies, Demand, Hawaii, Alaska, Technology, Research and development, Exploration, Groundwater recharge, Power plants, Desalination, Brines, Mining, Chemicals, Monitoring, Environmental effects, Hydrogen sulfide, Drilling, Model studies, Laboratory tests. Identifiers: Western U.S.

Members of numerous federal agencies cooperated in meeting the request of the President of the U.S. in his message on energy of June 1971. This report summarizes an assessment of geothermal energy resources. These resources are natural sources of clean energy, water and minerals that could have significant impact if fully developed. Steam and hot water could provide a substantial part of the Nation's electrical energy needs in the next few decades, especially in western states, Hawaii and Alaska. At least 19,000 MW of generating capacity could be installed by 1985 under present technology, or more than 75,000 MW by 2000 under successful research and development. Research, exploration, development akills, recharge, geothermal stimulation of dryocks, improved power generation technology, desalination of geothermal brines, geothermal mining of chemicals, monitoring environmental effects, romoval of H2S and noise from drilling, development of a model code, better government and related liaison, and establishment of several national geothermal field research laboratories are recommended. (Popkin-Arizona)

AN ECONOMIC ANALYSIS OF CENTER-PIVOT SPRINKLER IRRIGATION SYSTEMS IN SOUTHEASTERN WYOMING, WITH EMPHASIS ON FINANCING ALTERNATIVES, Wyoming Univ., Laramie. Dept. of Agricultural Economics. For primary bibliographic entry see Field 03F. W73-10700

CONCEPTUAL SYSTEM DESIGN FOR AN EN-VIRONMENTAL INFORMATION BASE FOR MANAGEMENT OF WATER AND RELATED RESOURCES BY STATES, Banks (Harvey O.), Inc., Belmont, Calif. For primary bibliographic entry see Field 10A. W73-10725

FORMATION OF PUBLIC POLICY ON ISSUE OF OUT-OF-BASIN DIVERSION OF CONNEC-TICUT RIVER FLOOD WATERS TO BOSTON METROPOLITAN AREA, Massachusetts Univ., Amherst. Water Resources

Research Center.
B. B. Berger, E. R. Kaynor, D. P. Fay, J. A.
McCann, and C. Barksdale.
Available from the National Technical Information Service as PB-221 123, \$3.00 in paper copy,
\$0.95 in microfiche. Completion Report, Publication No 28, 1973. 160p, 7 append. OWRR C-2169
(No. 3377)(1).

Descriptors: Water supply, "Inter-basin transfer, "Alteration of flow, "Connecticut River, "Social attitudes, Social participation, Decision-making, Environment, Sediment transport, Anadromous fish, Migration, Nutrients, Water quality, Estuarine environment, "Diversion. Identifiers: Northfield Mountain, "Boston, Quab-bin Reservoir, Metropolitan District Commission, Corps of Engineers.

Corps of Engineers.

A study of public response to the proposal to divert flood waters from the Connecticut River at the Northfield Mountain pumped-storage hydropower plant to Quabbin Reservoir, Boston's major water supply impoundment, showed that opposition, while appearing to be broadly based, was actually limited to a relatively few knowledgeable, highly motivated individuals whose efforts delayed project approval but did not succeed in significantly influencing public officials and decision-makers. A study of potential environmental impacts based on available but generally scanty data indicated that the reduction of flood flows as proposed would (1) have little effect on sediment transport; (2) not affect significantly anadromous fish migration; (3) not affect significantly the total nutrient contribution to Long Island Sound; (4) produce no significant effect on Biochemical Oxygen Demand or on coliform organism count; (5) possibly cause changes in the estuary, once of which by itself appears significant; (6) not affect significantly the Basin's future sources of water supply. The results do not support a contention that the proposed diversion would (1) be viewed by a majority of Basin residents as significantly deleterious; (2) produce a high probability of damage to ecologic and environmental values. (See W73-10726 htm.)

HISTORICAL, POLITICAL AND SOCIAL FACTORS AFFECTING PUBLIC POLICY ON RIVER DIVERSION: OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO THE BOSTON METROPOLITAN

AREA,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 03D.
W73-10727

ANNOTATED BIBLIOGRAPHY AND COM-MENTS ON SEDIMENTATION IN THE CON-NECTICUT RIVER, Vermont Univ., Burlington. For primary bibliographic entry see Field 02J. W73-10728

AN EVALUATION OF THE POSSIBLE EF-FECTS OF WATER DIVERSION OF THE CON-NECTICUT RIVER ON THE BIOLOGY OF ANADROMOUS FISH IN THE RIVER, Massachusett Univ. Amherst. For primary bibliographic entry see Field 021.

THE ROLE OF FLOOD FLOWS IN NUTRIENT SUPPLY AND REMOVAL AS A FACTOR IN THE EUTROPHICATION OF THE CONNEC-TICUT RIVER, New Hampshire Univ., Durham. For primary bibliographic entry see Field 05C.

W73-10730

WHAT IS THE ROLE OF FLOOD FLOWS IN THE POLLUTION OF THE CONNECTICUT RIVER AND ITS AMELIORATION, Massachusetts Univ., Amherst. For primary bibliographic entry see Field 05B. For primar W73-10731

A STUDY OF THE PROBABLE EFFECTS OF THE DIVERSION OF FLOOD WATERS UPON THE ECOLOGY OF THE CONNECTICUT THE ECOLOGY OF THE CONNECTOR RIVER ESTUARY, Connecticut Univ., Storrs. For primary bibliographic entry see Field 02L. W73-10732

ROLE OF CONNECTICUT RIVER FLOOD FLOWS IN RECHARGING GROUND-WATER FORMATIONS, Massachusetts Univ., Amherst.

For primary bibliographic entry see Field 04B. W73-10733

MAN-NATURE ATTITUDES OF ARIZONA WATER RESOURCE LEADERS, Maryland Dept. of Water Resources, Annapolis. R. A. Kanerva, and D. A. King. In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 53-66, (1972). 3 tab, 4 fig, 14 ref.

Descriptors: *Attitudes, *Arizona, *Water resources, *Administratios, Decision making, Environment, Cultures, Input-output analysis, Scaling, Water management (Applied), Arid lands.

A pilot study is developed to construct a scale which measures attitude towards human management in Arizona. The decision-maker's attitudes which measures attitude towards human management in Arizona. The decision-maker's attitudes toward his man-made and natural environments are investigated in terms of cultural (interior), natural (intermediate), and balanced (exterior) reference positions. A decision-making model consists of stimuli (inputs), decision-making (process function), and response (outputs). The 12 questions developed and applied to Arizona water managers were reduced to 8 capable scalogram analysis. These scaled questions related to favoring physical or emotional needs of man, deciding who gets what or increasing the supply, including behavioral patterns, protecting environmental areas, manipulation of resources as harmful or beneficial, municipal and industrial demands, opinions of groups, and possible overuse of resources. The scale met 5 criteria, which are defined by reproducibility, non-scale pattern of response, number of questions, error ratio and cross checking of responses. This study may provide managers with means of objectively evaluating and improving decisions. (See also W73-10818) (Popkin-Arizona) (Poplan-73-10823

ROLE OF MODERN METHODS OF DATA ANALYSIS FOR INTERPRETATION OF HYDROLOGIC DATA IN ARIZONA, Arizona Univ., Tucson. Dept. of Hydrology and

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

C. C. Kisiel, L. Duckstein, and M. M. Fogel.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 319-350, (1972). 4 tab, 36 ref.

Descriptors: *Hydrologic data, *Arizona, *Mathematical studies. *Statistical methods, *Decision

making, Water sampling, Model studies, Forecasting, Aquifers, Watersheds, Streamflow, Precipitation (Atmospheric), Control, Multiple purpose, Risks, Correlation analysis, Systems analysis, Regression analysis, Stream gages, Digital

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e 1972 Water 1972, f ref. Mathematical models, requiring substantial data, of hydrologic and water resources systems are under intensive investigation. The processes of data analysis and model building are interrelated so that models may be used to forecast for scientific reasons or decision making. Examples are drawn from research on modeling aquifers, watersheds, streamflow and precipitation in Arizona. Classes of problems include model choice, parameter estimates, initial condition, input identification, forecasting, valuation, control, presence of multiple objectives, and uncertainty. Classes of data analysis include correlation methods, system identification, stationarity, independence or randomness, seasonality, event based methods, system identification, stationarity, inde-pendence or randomness, seasonality, event based approach, fitting of probability distributions, and analysis for runs, range and crossing levels. Time series, event based and regression methods are reviewed. The issues discussed are applied to tree-ring analyses, streamflow gaging stations, and digital modeling of small watersheds and the Tuc-son aquifers. (See also W73-10818) (Popkin-Arizona) W73-10839

COST ANALYSIS OF WATER POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY, Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring. For primary bibliographic entry see Field 05G. W73-10879

VIRGINIA WATER POLICY: THE IMPRECISE VIRGINIA WATER POLICY: THE IMPRECISE MANDATE,
Virginia Polytechnic Inst. and State Univ.,
Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W73-10890

AQUATIC PLANT CONTROL RESEARCH PRO-JECT PLAN FY 73-77 (PPB REPORT), Corps of Engineers, Washington, D.C. For primary bibliographic entry see Field 03B. W73-10959

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A BUDGETING AND LINEAR PROGRAMMING ANALYSIS OF IRRIGATION WATER VALUES IN NORTHERN WYOMING, Wyoming Univ., Laramie. Dept. of Agricultural Economics. For primary bibliographic entry see Field 03F. W73-10699

DYNAMICS OF WASTE ACCUMULATION: DISPOSAL VERSUS RECYCLING, For primary bibliographic entry see Field 05G. W73-10739

PRICING OF POLLUTION: THE COASE THEOREM IN THE LONG RUN, California Univ., Los Angeles; and National Center for Health Services Research and Development, Rockville, Md. For primary bibliographic entry see Field 05G. W73-10740

LOWEST COST-PER-FOOT IS AIM OF OWN CALCULATIONS,
For primary bibliographic entry see Field 08G.

W73-10791

COST ANALYSIS OF WATER POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY, Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring. For primary bibliographic entry see Field 05G. W73-10879

THROUGH THE MINI MAZE, Interdata, Inc., Oceanport, N.J. For primary bibliographic entry see Field 07C. W73-11015

6D. Water Demand

WATER USE, (AWWA COMMITTEE REPORT). American Water Works Association, New York. Committee on Water Use.

Journal of the American Water Works Association, Vol 65, No 5, p 285-301, May, 1973. 2 fig, 2 tab, 1 ref.

Descriptors: Water resources development, *Water supply, *Water users, *Estimating, *Forecasting, Methodology, Evaluation, Analysis. Identifiers: Current trends, *Residential water.

Identifiers: Current trends, *Residential water.

Rapid urban development experienced in the past twenty years has imposed increasing demands on available water supply sources. Sound utility operations and development programs depend largely upon realistic forecasts of future requirements. Whether present indications of changes in trends are the result of temporary fluctuations or a more general, long-term leveling out of customer water requirements is a subject of increasing concern within the water industry. Results are presented studies which assess current trends in customer water use and factors studies which assess current trends in customer water of influencing trends in order to assist in the projection of future water requirements. Water usage is generally expressed in terms of usage per customer. The study examines the nature of current water user trends or changes based on recent water-industry experience. Discussed are changes in climatological conditions, residential living patterns, established area occupancy and land use, and economic and business conditions. Part II reviews the 1966 Johns Hopkins University proposed method of estimating future residential water demand requirements for use in distribution-system analysis; its applicability as a practical method for use by utility managers and engineers in estimating future residential average and peak-flow requirements in individual communities is evaluated. (Bell-Cornell)

6E. Water Law and Institutions

TECHNICAL, ECONOMIC AND LEGAL ASPECTS INVOLVED IN THE EXCHANGE OF SEWAGE EFFLUENT FOR IRRIGATION WATER FOR MUNICIPAL USE, CASE STUDY-CITY OF TUCSON, Arizona Water Resources Research Center, Tucson,

For primary bibliographic entry see Field 05D. W73-10402

MOBILIZATION AND PARTICIPATION OF CITIZENS GROUPS IN IMPROVING THE QUALITY OF WATER RESOURCES ENVIRON-

THE INTERNATIONAL HYDROLOGICAL DECADE—A PRELIMINARY EVALUATION OF A COOPERATIVE EFFORT IN THE EARTH SCIENCE FIELD, For primary bibliographic entry see Field 02A. W73-10424

INTERNATIONAL CO-OPERATION FOR POL-LUTION CONTROL, United Nations Inst. for Training and Research, New York. For primary bibliographic entry see Field 05G. W73-10566

INTERNATIONAL ENVIRONMENTAL CONTROLS IN THE SCIENTIFIC AGE, Columbia Univ., New York. Inst. for the Study of Science in Human Affairs.

For primary bibliographic entry see Field 05G. W73-105G.

THE IMCO EXPERIENCE, Intergovernmental Maritime Consultative Or-ganization, London (England). Legal Div. For primary bibliographic entry see Field 05G. W73-1056

THE POTENTIAL OF REGIONAL ORGANIZA-TIONS IN MANAGING MAN'S ENVIRON-MENT, MENT,
Woodrow Wilson International Center for
Scholars, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-1059

PROCEEDINGS OF THE 1971 OSTAC ANNUAL MEETING, STATE DEPARTMENT, WASHING-TON, D.C. 2-3 JUNE 1971. For primary bibliographic entry see Field 05G. W73-10570

DEPARTMENT OF INTERIOR PROGRAM, Bureau of Outdoor Recreation, Washington, D.C. For primary bibliographic entry see Field 05G. W73-10571

FEDERAL INTERACTION WITH STATES, Virginia Inst. of Marine Sciences, Gloucester Point. For primary bibliographic entry see Field 05G. W73-10572

LONG ISLAND'S APPROACH TO ENVIRON-MENTAL QUALITY, Ocean Systems, Inc., Reston, Va. For primary bibliographic entry see Field 05G. W73-10573

DELAWARE MARINE RELATED STUDY, Hercules, Inc., Wilmington, Del. For primary bibliographic entry see Field 05G. W73-10574

CALIFORNIA'S MARINE PROGRAM, Modern Management, Beverly Hills, Calif. For primary bibliographic entry see Field 05G. W73-1057.

POLLUTION OF THE MARINE ENVIRON-MENT AND THE EFFECTS THEREFROM: THE CASE FOR STRICTER ENFORCEMENT, York Univ., Downsview (Ontario). Faculty of En-vironmental Studies. For primary bibliographic entry see Field 05C. W73-10581

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

A PREDICTIVE MODEL FOR UPPER RIO--GRANDE INDEX FLOWS, Colorado Div. of Water Resources, Denver. For primary bibliographic entry see Field 04A. W73-10620

CONSTRAINTS IN WATER MANAGEMENT ON AGRICULTURAL LANDS, Colorado State Univ., Fort Collins. Dept. of For primary bibliographic entry see Field 03F. W73-10621

THE METROPOLIS RUNS DRY, Massachusetts Univ., Boston. Dept. of Political R. A. Hogarty.

Journal of the Irrigation and Drainage Division,
American Society of Civil Engineers, Vol 97, No
IR4, p 559-570, December, 1971. 1 fig. 14 ref, 1 ap-

Descriptors: "Droughts, "Water shortage, "Water allocation, "Management, Low-flow augmentation, Water demand, Water supply, Administration, Water releases, Water conservation, Planning, "Delaware River Basin Commission, Delaware River basin.

The drought that occurred in the northeastern United States from 1961 to 1967 and its effects in the Delaware River Basin are discussed. Because the Delaware Kiver Basin are discussed. Because of the great demands for water in the Delaware River Basin (e.g. Philadelphia, New York City) the drought reached a crisis level in 1965 when New York City began to withhold water releases from its reservoirs in the headwaters of the basin. These downstream releases were required by a Supreme Court ruling and formula to preserve minimum flows in the river and maintain Philadelphia's water supply. When the formula proved to be un-workable the Delaware River Basin Commission workable the Delaware River Basin Commission stepped in and took on the role of arbitrator and water allocator. The Commission helped create a water bank plan, formulate flexible downstream release strategies, and ellicit cooperation from various private reservoirs to maintain minimum flows in the river. In addition, local governments nows in the river. In addition, local governments initiated water conservation programs and agreements to share water supplies, the State of New Jersey took over temporary management of several reservoirs, and the federal government provided assistance. However, the key conclusion is that the Delaware River Basin Commission played a most significant role in the control of the co played a most significant role in terms of flexible management. (Elfers-North Carolina) W73-10686

MODEL FLOOD PLAIN ZONING ORDINANCE, Mid-Ohio Regional Planning Commission, Colum-

For primary bibliographic entry see Field 06F. W73-10691

WATER AND RELATED LAND RESOURCES TRAINING NEEDS STUDY, COMPREHENSIVE PLANNING FOR WATER AND RELATED LAND RESOURCES IN ALABAMA, Auburn Univ., Ala. Center for Urban and Regional For primary bibliographic entry see Field 09A.

SOME LEGAL PROBLEMS OF URBAN RU-NOFF, Arizona Univ., Tucson. Coll. of Law.

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H. Holub.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972,

Prescott, Arizona, p 169-179, (1972). OWRR B-012-ARIZ (3).

Descriptors: *Legal aspects, *Urban runoff, *Southwest U.S., *Arid lands, *Urbanization, Beneficial use, Watershed management, Floods, Water rights, Land use, Regulation, Banks, Flood plains, Condemnation, Parks, Easements, Financiag, Zoning, Coordination, Storm drains, Diversion, Recreation facilities, Flood control, Legisla-Identifiers: Tort liability, Litigation

Pressure is being brought to bear on national resources of air, earth, and water in the growing cities in the arid Southwest. Legal questions involved in capturing urban runoff and putting it to a beneficial use are examined. Urbanization of a watershed results in a 3 to 5 fold increase in runoff amounts. Legal aspects include tort liability from floods, water rights to the increased flows, land use restrictions along banks and flood plains, condemnation of land for park development and flowage easements, financing problems, zoning applications, and coordination of governmental bodies responsible for parks, storm drainage and related services. Urban runoff is the most obvious legal problem in the tort liability area. It appears feasible to divert small quantities of water from urban wastes for recreational uses which provide flood control benefits. It appears that municipaliurban wastes for recreational uses which provide flood control benefits. It appears that municipali-ties could appropriate increased flows caused by urbanization. The ultimate legal questions remain to be resolved by legislation, litigation or exten-sion of the appropriative system. (See also W73-10818) (Popkin-Arizona) W73-10830

VIRGINIA WATER POLICY: THE IMPRECISE

MANDATE, Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. W. R. Walker, and W. E. Cox. William and Mary Law Review, Vol 14, No 2, p 312-325, Winter, 1972. OWRR B-025-VA (1).

Descriptors: *Water policy, *Water law, *Administrative agencies, Conservation, Erosion, Wetlands, Pollution, Riparian doctrine, *Virginia, *Management, *Planning, River basin develop-

Identifiers: Virginia constitution, Legislative pol-icy, Public interest, Water power, Scenic values.

An analysis of the principal sources of Virginia water policy indicates that each contains elements of a comprehensive policy statement but that no single source is adequate. The policy declaration broached in the State Constitution is in general terms only. The independent elements of state water policy enunciated by various legislative enactments are inconsistent. The legislative desention of policy-making authority to several delegation of policy-making authority to several agencies has resulted in lack of coordination in agencies has resulted in lack or coordinated policy and interagency conflicts. The state government traditionally has left the determination of individual water rights to the courts where the riparities has been interpreted and applied. and doctrine has been interpreted and applied.

Thus, the 'administration' of water rights and the establishment of related policy, has in large part been accomplished by the state courts rather than by the legislative or executive branches of government. by the legislature of executive branches of government. The logical form for a comprehensive water policy to guide future water use appears to be a statutory enactment. The statement of water policy must recognize relationships between various aspects of water conservation and development, and it must manifest this recognition through coordination of existing policy elements. W73-10890

PRODUCTIVITY PROBLEMS OF FRESH-

Polish Academy of Sciences, Warsaw. Inst. of For primary bibliographic entry see Field 05C.

W73-10805

6F. Nonstructural Alternatives

HYDROLOGICAL STUDIES OF THE UPPER PARAGUAY RIVER BASIN (PANTANAL RE-GION, MATO GROSSO STATE, BRAZIL), United Nations Educational, Scientific and Cul-tural Organization, New York. Div. of Natural Resources Research. For primary bibliographic entry see Field 02E. W73-10682

MODEL PLOOD PLAIN ZONING ORDINANCE, Mid-Ohio Regional Planning Commission, Colum

H. T. Merwin, T. Richardson, and R. J. Holland. June, 1972. 34 p, 4 fig. HUD - Ohio P-289.

Descriptors: *Flood plain zoning, *Flood plains, Land use, Floodways, Planning, Legislation, *Ohio

Identifiers: *Flood plain management, *Model ordinance, Flood hazard areas, Mid-Ohio Regional Planning Commission.

As a preface to the model ordinance, this report in-As a presence to the model ortunance, this report in-cludes a discussion of the need for flood plain management, an explanation of some of the terms and administrative procedures involved in the or-dinance, and the resolution of the Mid-Ohio Re-gional Planning Commission adopting the or-dinance. The problems involved with urbanization of flood plains and the need for proper land use planning and flood plain management are emphasized. The MORPC intends to use the model ordinance to help communities in the planning area adopt and implement flood plain zoning. The model ordinance would establish flood plain disricts, according to the determination of flood hazard areas, and define which land uses would be permitted and prohibited within the districts. The ordinance also provides for conditional uses via special permits, a board of adjustment, and ap-peals and hearings procedures. (Elfers-North Carolina) W73-10691

AN ANNOTATED OUTLINE OF A WATER-RESOURCES DEVELOPMENT PLAN FOR ALABAMA, Geological Survey of Alabama, University. For primary bibliographic entry see Field 06B. W73-10694

FLOOD PLAIN INFORMATION--MEADOW CREEK, EAGLE RIVER, ALASKA. Army Engineer District, Anchorage, Alaska. For primary bibliographic entry see Field 04A.

6G. Ecologic Impact of Water Development

THE ECONOMIC EFFECTS OF PAW-TUCKAWAY STATE PARK: V. EFFECT OF PARK USE ON ENVIRONMENTAL QUALITY, New Hampshire Univ., Durham. Water Resources Research Center. For primary bibliographic entry see Field 05C. W73-10562

INTERNATIONAL ENVIRONMENTAL CON-INVERNATIONAL ENVIRONMENTAL CONTROLS IN THE SCIENTIFIC AGE, Columbia Univ., New York. Inst. for the Study of Science in Human Affairs. For primary bibliographic entry see Field 05G. W73-10567

Data Acquisition—Group 7B

SOME ECOLOGICAL ASPECTS OF A NEST-ING COLONY OF HERONS, Auburn Univ., Ala. For primary bibliographic entry see Field 02H.

W73-10651

FORMATION OF PUBLIC POLICY ON ISSUE OF OUT-OF-BASIN DIVERSION OF CONNECTICUT RIVER FLOOD WATERS TO BOSTON METROPOLITAN AREA,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
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AN EVALUATION OF THE POSSIBLE EF-FECTS OF WATER DIVERSION OF THE CON-NECTICUT RIVER ON THE BIOLOGY OF ANADROMOUS FISH IN THE RIVER, Massachusetts Univ., Amherst. For primary bibliographic entry see Field 02L W73-10729

THE ROLE OF FLOOD FLOWS IN NUTRIENT SUPPLY AND REMOVAL AS A FACTOR IN THE EUTROPHICATION OF THE CONNEC-

TICUT RIVER,
New Hampshire Univ., Durham.
For primary bibliographic entry see Field 05C.

AN INVESTIGATION OF COLORADO RIVER TRIPS: A USER STUDY, Arizona Univ., Tucson. Dept. of Hydrology and

M. A. Boster, and R. L. Gum.

In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 1-17 (1972), 3 fig. 5 tab, 2 ref.

Descriptors: *Colorado River, *Scenic highways, *Recreation demand, *Recreation facilities, *Psychological aspects, River Basin development, Public access, Public benefits, Analysis, River regulation, Decision making, Institutions, Na-tional Parks.

Identifiers: *Grand Canyon National Park and Monument, *Colorado River Outfitters Associa-

Increased useer intensity of the Colorado River through Grand Canyon National Park and Monu-ment required the National Park Service and the Colorado River Outfitters Association to adopt new policies to improve the service of the colorador. new policies to improve the quality of river trips and to protect the river. This study was undertaken to gain a greater awareness and understanding of visitor expectations, perceptions, interactions, satisfactions and dissatisfactions by malutis of expenses. analysis of response to a questionnaire mailed to a random sample of 2,622 past river runners from which a 65 percent return was received. Analysis of individual question tabulation and multivariate data-cluster analysis were performed. Users found ding or user density to be at least tolerable. The largest group of runners were average in wil-derness or other activities, and low relative to less stremous activities. A large group of runners had relatively little experience in the wilderness. A resurvety little experience in the winderness. A large group of runners enjoyed the trip, desired more regulations, and were moderate about taking more trips. A large group rated the trip as a wilderness adventure which provided the opportunity to 'get away'. Cluster analysis is shown to be a useful tool of policy-making institutions. (See also W73-10818) (Popkin-Arizona) THE SPOILS OF PROGRESS: ENVIRONMENTAL POLLUTION IN THE SOVIET UNION, For primary bibliographic entry see Field 05G. W73-10877

BENEFICIAL AQUATIC PLANTS IN COASTAL AREAS, Army Engineer District, Mobile, Ala. For primary bibliographic entry see Field 03B. W73-10955

07. RESOURCES DATA

7A. Network Design

A NETWORK FOR CONTINUOUS MONITOR-ING OF WATER QUALITY IN THE SABINE RIVER BASIN, TEXAS AND LOUISIANA, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 05A. W73-10683

FOCUS ON A/D AND D/A CONVERTERS, For primary bibliographic entry see Field 07C. W73-11018

7B. Data Acquisition

METHODS OF MEASURING MASS WASTING; REVIEW AND CRITIQUE, Portland State Univ., Oregon. For primary bibliographic entry see Field 02J. W73-10422

GUIDE TO WORLD INVENTORY OF SEA, LAKE AND RIVER ICE. For primary bibliographic entry see Field 02C. W73-10427

DETERMINATION OF NANOGRAM LEVELS
OF SILVER IN SUSPENDED MATERIALS OF
STREAMS RETAINED BY A MEMBRANE
FILTER WITH THE "SAMPLING-BOAT"
TECHNIQUE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W73-10429

A RAPID SENSITIVE METHOD FOR THE DETERMINATION OF THE CHEMICAL OXYGEN DEMAND OF POLLUTED WATERS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05A. W73-10434

SNOW STUDIES USING THERMAL INFRARED MEASUREMENTS FROM EARTH SATEL-LITES, Environmental Research and Technology, Inc.,

Lexington, Mass.
For primary bibliographic entry see Field 02C.
W73-10435

WATER QUALITY DETERMINATIONS IN THE VIRGIN ISLANDS FROM ERTS-A DATA, Grumman Aerospace Corp., Bethpage, N.Y. Research Dept. For primary bibliographic entry see Field 05B. W73-10437

ANALYSIS OF WATER CONSUMPTION OF VARIOUS GRAPE CULTIVARS, Levi Eshkol School of Agriculture, Jerusalem For primary bibliographic entry see Field 02D. W73-10440

TRACER SIMULATION STUDY OF POTEN-TIAL SOLUTE MOVEMENT IN PORT ROYAL SOUND, SOUTH CAROLINA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05B. W73-1046

SOME RESULTS AND WAYS OF DEVELOPING METHODS OF STREAMFLOW MEASURE-MENT IN MOUNTAIN COUNTRIES (NEKOTO-RYYE ITOGI I PUTI RAZVITIYA SPOSOBOV RASCHETA STOKA V USLOVIYAKH GORNYKH STRAN), Sredneaziatkii Nauchno-Isaledovatelskii Gidrometeorologicheskii Institut, Tashkent

ziatskii Nauchno-Issledovatelskii eteorologicheskii Institut, Tashkent

(USSR).
V.L. Shul'ts.
In: Vodnyy balans territorii Sredney Azii;
Sredneaziatskiy Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 62
(77), p 3-16, Leningrad, 1972.

Descriptors: *Analytical techniques, *Flow measurement, *Regions, *Mountains, Topography, Rusoff. Identifiers: USSR, Isolines.

Development of methods for measurement of mountain streamflow in the absence of data began in the USSR and abroad more than 35 years ago. The vast influence of topography on water supply and regime of mountain streams and the poor meteorological coverage of mountain regions have led to a search for relationships between many runoff characteristics and elements of the relief. For watersheds with small drainage areas (less than 100 sq km), nonclimatic factors and climatic anomalies must be considered. Assuming all conditions are observed, the method of isolines can and should be used. For mountain countries, the method of analogy may be complicated by absence of a common analog for all runoff characteristics and by remoteness of the analog from the river for which runoff characteristics are being defined. Improvements in river discharge measurement which runoff characteristics are being defined. Improvements in river discharge measurement require: (1) development of empirical methods of computation of runoff characteristics; (2) study of runoff components and patterns of runoff distribution in area and time; and (3) development of theoretical methods of computation, including mathematical modeling. (See also W73-10448) (Josefson-USGS)
W73-10449

OIL/WATER INTERFACE DETECTOR, Esso Research and Engineering Co., Florham Park, N.J. For primary bibliographic entry see Field 05A. W73-10466

MULTI-SENSOR DETECTION AND TRACKING OF CONTROLLED OIL SPILLS, Spectran, Inc., Hollywood, Calif. Microwave Sen-sor Systems Div. For primary bibliographic entry see Field 05B. W73.10467.

GUIDE TO SELECTING UNINTERRUPTIBLE POWER SYSTEMS.

Instruments and Control Systems, Vol. 46, No. 3, p 84-86, March 1973. 4 fig. 1 tab.

Descriptors: *Electrical equipment. Identifiers: *Uninterruptible power systems, Power supplies.

The general characteristics of uninterruptible power systems are described. There are basically two systems: rotating power systems which employ flywheels to filter the effects of transients, maintain rotation after power failure, and start the auxiliary prime mover; and static systems which employ batteries and DC-to-AC converters. The

Field 07—RESOURCES DATA

Group 7B-Data Acquisition

advantages and disadvantages of the systems are described, and manufacturers are listed. (Little-Battelle) W73-10472

A QUANTITATIVE PUSH-NET SYSTEM FOR TRANSECT STUDIES OF LARVAL FISH AND MACROZOOPLANKTON, Hawaii Inst. of Marine Biology, Honolulu.

Limnology and Oceanography, Vol 18, No 1, p 175-178, January 1973. 2 fig, 4 ref.

Descriptors: *Larvae, *Distribution patterns, *Zooplankton, *Fish, Water sampling, Equipment, Hawaii, Spatial distribution, Construction, Design, Invertebrates, Plankton nets, Surface

waters.
Identifiers: *Macroinvertebrates, *Push-net sampling system, Pranesus insularum, Kaneoche Bay.

A surface plankton sampler that quantitatively samples contiguous segments of a transect has characteristics that include operability in shallow water by two investigators, paired, self-cleaning nets, a minimum of obstructions preceding the nets, and a high ratio of filtering area to mouth area. Flow through each net and the distance traveled are monitored and recorded continuously with modified TSK current meters. At a boat speed of about 3 mph (1.34 m/sec), a samp obtained in 3 min from a 241-m segment of a 7.2-km transect in Kanehoe Bay (Oahu, Hawaii). At km transect in Kanehoe Bay (Oahu, Hawaii). At this operating speed, the combination of 505-micron Nitex nets and 333-micron Nitex bags yields fish larvae (2-25 mm) in good condition. Larvae of 92 species of fish (size range, 2-20 mm) have been taken with the gear from Kaneoche Bay over a one-year period. Total sampling time was less than 2 hr with this system. Using the sampling technique being described, small scale variations in the abundance of surface zooplankton can be detected. (Holoman-Battelle) in the abundance of surface zooplankton can be detected. (Holoman-Battelle)

MODIFICATIONS OF THE BIRGE-EKMAN BOX CORER FOR USE WITH SCUBA OR DEEP SUBMERGENCE RESEARCH VESSELS, Woods Hole Oceanographic Institution, Mass. G. T. Rowe, and C. H. Clifford.

Limnology and Oceanography, Vol 18, No 1, p 172-175, January 1973. 1 fig, 1 tab, 7 ref.

Descriptors: *Sampling, *Equipment, *Scuba diving, Shallow water, Deep water, Construction, Design. Identifiers: *Birge-Ekman box corer, *Research

The Birge-Ekman box corer has been modified for use by SCUBA divers or deep submergence research vessels, thus allowing control in the precision of sampling. Data suggest that the modified box corer exhibits greater accuracy and precision in estimating the abundance of species and individuals than conventional surface ship samplers or smaller corers used widely for in situ investigations. (Holoman-Battelle)

DEVELOPMENT OF AN OIL/WATER POLLU-TION MONITOR, Naval Postgraduate School, Monterey, Calif.

For primary bibliographic entry see Field 05A. W73-10491

MEASUREMENT OF CURRENT AND POTEN-TIAL DISTRIBUTION AT ROTATING-DISK

ELECTRODES, Bell Telephone Labs., Inc., Murray Hill, N.J. B. Miller, and M. I. Bellavance.

Journal of the Electrochemical Society, Vol 120, No 1, p 42-53, January 1973. 15 fig, 6 tab, 26 ref.

Descriptors: "Zeta potential, "Electric currents, "Measurement, Laboratory tests, Electrical re-sistance, Electrical properties, Instrumentation. Identifiers: "Rotating disk electrode, "Current dis-tribution, Collection efficiency, Potentiometry,

Current distribution at the rotating disk electrode has been experimentally evaluated by several techniques including single and double reference probe potential mapping, ring-disk electrode collection efficiency and resistive interaction, interrupter and steady-state resistance measurements, and automatic ohmic compensation methods. Mapping experiments are in quantitative agreement with the predictions of Newman's theory for this system and were further confirmed by resistance determinations and theoretically based correction methods. The implications of the data for various ring-disk and nonsteady-state experiments and also the utility of an approximate approach to estimating the degree of nonuniform current distribution are examined. (Holoman-Battelle) W73-10498

OPTIMUM SAMPLE SIZES FOR THE COM-PARISON OF THE CONTROL AND TREAT-

MENT, National Cancer Inst., Bethesda, Md. Mathemati-cal Statistics and Applied Mathematics Section. J-M. Nam.

etrics, Vol 29, No 1, p 101-108, March 1973. 3

Descriptors: *Statistical methods, Sampling. Identifiers: *Sample size determination, Method

The optimum sample sizes for the control and treatment groups for testing the difference between average survival times are investigated when the costs of testing the two groups differ. Situations are considered where the test cost per subject is constant and independent of its survival subject is constant and independent of its survival time as well as where it is proportional to its sur-vival time. The optimum sample sizes are greatly preferred over equal sample sizes when the dif-ference between the cost for the control and that for the treatment is large. (Little-Battelle) W73-10503

TWO INSTRUMENTS FOR ACTIVATION ANALYSIS OF SOLUTIONS BY A DILUTION

Instituut voor Kernphysisch Onderzoek, Amsterdam (Netherlands). P. W. F. Fouwrier, A. H. W. Aten, Jr., and J. Van

International Journal of Applied Radiation and Isotopes, Vol 24, No 3, p 147-151, March 1973. 1 fig, 1 tab, 1 ref.

Descriptors: *Aqueous solutions, *Neutron activation analysis, *Laboratory equipment, Design. Identifiers: *Sample preparation, Irradiation.

Two methods are described for the determination Iwo methods are described for the determination of the concentration of a main component in an aqueous solution by activation with a radioactive neutron source. The first method employs a rotating table with eight lucite vessels which contain the unknown and reference samples. The neutron source is contained in a lucite plug filled with paraffin and positioned in the center of the table. The second method employs a cylinder or sphere which contains the sample for activation. The neutron source is placed in the center for sample activation and then replaced by one or more counters for analysis. Corrections necessary for analy ters for analysis. Corrections necessary for analysis by either method are given. The first technique has the advantage of using less material and of being less susceptible to disturbing influences due to impurities or differences in concentration. The second instrument is easier to obtain since it requires no special equipment except a neutron source, a counter, and glassware. (Little-Battelle) W73-10509

MODIFICATION OF AN ISCO DRUM FRAC-TION COLLECTOR TO PERMIT USE OF STOPPERED TEST TUBES, Rockefeller Univ., New York. For primary bibliographic entry see Field 05A. W73-10513

A NEW, SENSITIVE METHOD FOR THE DETERMINATION OF STREPTOMYCIN, Magyar Tudomanyos Akademia, Szeged. Inst. of Biochemistry. For primary bibliographic entry see Field 05A. W73-10514

DIRECT MEASUREMENT OF LESS THAN 1 DIRECT MEASUREMENT OF LESS THAN 1
PART-PER-BILLION FLUORIDE IN RAIN,
FOG, AND AEROSOLS WITH AN ION-SELECTIVE ELECTRODE,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05A.
WITH 10536. W73-10526

A METHOD FOR COMPUTING REGRESSION COEFFICIENTS UTILIZING INCOMPLETE OBSERVATIONS,

American Univ., Washington, D.C. C. J. Lynch.

Available from University Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich., 48106, Order No. 73-1350. Ph D Dissertation, 1972. 78 p.

Descriptors: *Statistical methods, *Regression analysis, Least squares method, Model studies. Identifiers: Estimators, *Regression coefficients, *Incomplete observations, Monte Carlo method, Variance-covariance matrix, Mean square error, Variance, Bias, Data interpretation.

A method is presented for estimating coefficients A method is presented for estimating coefficients of linear regressions when some observation data are missing at random. The linear model is given by Y sub t equals beta sub o plus beta sub 1 X sub t 1 plus ... plus beta sub PX sub tP plus e sub t, where the index t identifies the observation number and the e sub t are independent random disturbance terms with mean value O and (unknown) variance sigma squared. Coefficients are estimated for the conditional distribution of Y given fixed values of the X's. Observation data consist of vectors drawn from some unspecified multivariate population. Some observation vectors have components missing at random, but it is assumed that N of these vectors have at least one X value available. These N vectors are used for comvalue available. These is vectors are used to com-puting estimators of the regression coefficients. In the process of deriving these estimators, denoted by a sub ij, missing data are approximated as regressands in least squares equations whose parameters are computed over the subset of parameters are computed over the subset of complete observations. The s sub ij are then inserted in classical least squares formulas and estimators (consistent (C) estimators) of the parameters beta sub k, k equals O, 1, ..., P are derived. The asymptotic variance-covariance matrix of the C estimators is derived for the case of no missing dependent variables. Monte Carlo experiments dependent variables. Monte Carlo experiments were conducted to compare the C estimators to calssical least squares estimators based on the subset of complete observations and to Glasser's estimators, the only other published set of consistent estimators, applicable to more than two non-random independent variables. The experiments were conducted for N equals 25 with P equals 3 and for N equals 40 with P equals 5. The sample meansquare-error and, separately, the absolute value of the sample bias were used as test criteria. The Monte Carlo experiments suggest that the C estimators retain their relative superiority over Glasser's estimators with respect to both mean-square-error and bias and over classical least squares with respect to mean-square-error for N equals 25 with P equals 3 and for N equals 40 with P equals 5. The Monte Carlo experiments also suggest that the C estimators retain their relative superiority over classical least squares with respect to bias for N equals 40 with P equals 5, but the reverse is true for N equals 25 with P equals 3. (Holoman-Battelle)
W73-10533

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LARGER DIAMETER COLUMNS FOR MODERN, HIGH SPEED LIQUID CHRO-MATOGRAPHY, Delaware Univ., Newark. For primary bibliographic entry see Field 02K. W73-10539

METHOD FOR HIGH-SPRED LIQUID CHROMATOGRAPHIC ANALYSIS OF BENOMYL AND/OR METABOLITE RESIDUES IN COW MILK, URINE, FECES, AND TISSUES, Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Industrial and Biochemicals Dept. For primary bibliographic entry see Field 05A. W73-10547

A STUDY TO IMPROVE DISSOLVED OXYGEN ANALYSIS TECHNIQUES TO FACILITATE WATER QUALITY FIELD SURVEY APPLICA-TIONS, Arkansas Univ., Little Rock, Dept. of Electronics

and Instrumentation.
For primary bibliographic entry see Field 05A.

A PROTOTYPE TOTALISING CURRENT-M-ETER (MARK II); A SELF-MOORED VERSION FOR NEAR-SURFACE USE ESPECIALLY IN FOUL WATER ESTUARIES IN CONNECTION WITH POLLUTANT DISPERSAL STUDIES, National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 05B.
W73-10580

SIDE-LOOK RADAR PROVIDES A NEW TOOL FOR TOPOGRAPHIC AND GEOLOGICAL SUR-

Westinghouse Defense and Electronic Systems Center, Baltimore, Md. R. E. Powers. Westinghouse Eng., Vol 32, No 6, p 176-181, Nov 1972. 2 photo, 3 dwg.

Descriptors: "Geological surveys, "Geologic investigations, "Aerial photography, Mapping, Geologic mapping, Aerial surveys, Photogeology, Remote sensing, Surveying, Surveys, Terna analysis, "Topographic mapping, Radar, Faults (Geologic). Identifiers: "Radar images, Nicaragua, Resolution, Distortion (Optics), Vegetal cover.

tion, Distortion (Optics), Vegetal cover.

Side-look radar (SLR) imagery is now being used for aerial mapping of large areas of the world. Geologists are beginning to recognize the SLR capability to display landforms and surface expressions of subsurface geological structures. In equatorial regions that are almost constantly covered with clouds, SLR penetrates the clouds, allowing mapping that would be difficult using serial photography. In Ecuador, a drainage map produced by SLR imagery was superior to infrared photography methods often used. In the Southwestern US, SLR imagery located important geologic faults not visible from aerial photographs. In Nicaragua, obtaining SLR imagery for the entire country took 7 days, and 4 months later, comprehensive maps were prepared showing geology, geomorphology, surface drainage, generalized land use, and vegetation. SLR imagery is accomplished from an airplane by recording a television like picture one line at a time. The traversing cathoderay-tube trace varies in intensity as the

returning signal amplitude varies. Resolution and distortion of SLR imagery are discussed. Possible future uses include updating maps and identifying surface materials. (USBR)

INITIAL WETTING LOSSES INCURRED BY GROUND LEVEL STEREO GAGES, Bidgenoessische Technische Hochschule, Zurich, (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie. For primary bibliographic entry see Field 02G. W73-10659

GEOHYDROLOGIC STUDY OF THE GORT LOWLAND AND ADJACENT AREAS OF WESTERN IRELAND USING ENVIRONMENTAL ISOTOPES, Ceylon Univ., Peradeniya. For primary bibliographic entry see Field 02F. W73-10666

MASS BALANCE AND SPECTRAL ANALYSIS APPLIED TO KARST HYDROLOGIC NET-WORKS, Alberta Univ., Edmonton. Dept. of Geography. For primary bibliographic entry see Field 02F. W73-10661

AN ON-SITE HYDROLOGIC DATA RECORD-ING SYSTEM, Utah Water Research Lab, Logan. D. G. Chadwick. Water Resources Bulletin, Vol 9, No 2, p 328-337,

April 1973. 9 fig, 1 ref.

Descriptors: *Data collections, *Hydrologic data, *Telemetery, *Instrumentation, Precipitation (Atmospheric), Rainfall, Rain gages, Anemometers, Water levels, Stream gages.

A system for collecting hydrologic data has the capability to operate unattended for long periods of time, reliably sensing and digitizing data at predetermined intervals for data transmission or storage. Little power is needed for system operation in the standby mode. Batteries supply the energy required for operation, so it can be used in remote places. Data are taken from a precipitation gage, temperature probe, wind direction indicator, wind sensor, and water-level sensor. The system is periodically actuated by a solid-state clock. The record is made on an 8-channel paper-tape punch. (Knapp-USGS)

PRECISE WATER VELOCITY MEASURE-MENTS USING PHOTOGRAMMETRIC PRECISE WATER VELOCITY MEASURE-MENTS USING PHOTOGRAMMETRIC TECHNIQUES, Wisconsin Univ., Madison. Dept. of Civil and En-vironmental Engineering. For primary bibliographic entry see Field 05B. W73-10678.

TEST RESULTS OF SIX-MONTH TEST OF TWO WATER ELECTROLYSIS SYSTEMS, McDonnell Douglas Astronautics Com., Huntington Beach, Calif. Biotechnology and Power Dept. For primary bibliographic entry see Field 02K. W73-10685

STUDY OF THE STATE OF WATER AND WATER EXCHANGE OF A PLANT CELL BY IR ABSORPTION SPECTRA, (IN RUSSIAN), Kazan State Univ., (USSR).

N. V. Sedykh, and E. A. Stupishina.
Fiziol Biokhim Kul't rast. Vol 4, No 3, p 295-299, 1972. Illus. English summary.
Identifiers: Absorption spectra (Plants), *Plant tissues, Spectra, *Plant cells, *Infrared radiation.

IR-spectra of some plant tissues and cellular struc-tures were used to calculate the strength of hydrogen bonds and ratio of ice-like and dense-packed structures in tissue water. A higher struc-turization of water was found in mesophyll, grow-ing cell and organelles. —Copyright 1973, Biologi-cal Abstracts, Inc. W73-1070.

LEAF DIFFUSION RESISTANCE TO WATER VAPOUR AND ITS DIRECT MEASUREMENT:
I. INTRODUCTION AND REVIEW CONCERNING RELEVANT FACTORS AND METHODS,
Agricultural Univ., Wageningen (Netherlands).
Lab. of Physiological Meteorology.

Lab. of Physiological Meteorology.

C. J. Stigter.

Meded Landbouwhogesch Wageningen. Vol 72,
No 3, p 5-47, 1972. Illus.
Identifiers: Diffusion, *Leaf diffusion, Measurement, Review, *Wallihan meter, *Water vapor.

Relevant factors and methods were discussed and a literature review was given regarding direct measurement of leaf diffusion resistance to water vapor, with emphasis on field measurements. Leaf resistance, canopy climate, and behavior of stomata were discussed. Components of diffusion resistance and the factors which influence its value were listed. An apparatus for vertical profile measurements within a canopy, the Wallihan leaf diffusion resistance meter, was discussed.—Copyright 1973, Biological Abstracts, Inc. W73-10703

60 GHZ RADIOMETRIC LOCAL VERTICAL SENSOR EXPERIMENT, Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development

Div. C. H. Grauling, Jr. National Aeronautics and Space Administration Contractor Report NASA CR-2229, April 1973. 198 p. 102 fig. 11 tab, 47 ref., append. NASI-10131.

Descriptors: "Radiation, "Electromagnetic waves, "Remote sensing, "Satellites (Artificial), "Radio waves, Research and development, Atmosphere, Oxygen, Light intensity, Temperature, Model studies, Computer programs, Systems analysis, Instrumentation.

Identifiers: "Radiometric vertical sensor, Radiance profile."

ance profile.

Major results are summarized for spacecraft development of the Radiometric Local/Vertical Sensor Experiment. The experiment involves the use of millimeter wave radiation from the atmospheric oxygen to provide vertical sensing information to a satellite-borne radiometer. The radiance profile studies require the calculation of ray brightness temperature as a function of tangential altitude and atmosphere model, and the computer program developed for this purpose is discussed. Detailed calculations were made for a total of 12 atmosphere models, including some showing severe warming conditions. The experiment system analysis investigates the effect of various design choices on system behavior. Calculated temperature profiles are presented for a wide variety of frequencies, bandwidths, and atmosphere models. System performance is determined by the convolution of the brightness temperature and an assumed antenna pattern. A commined by the convolution of the brightness tem-perature and an assumed antenna pattern. A com-pensation scheme to account for different 'plateau' temperatures is developed and demon-strated. Curves of predicted system behavior are presented for many different atmosphere com-binations, antenna pattern shapes, and antenna beamwidths. The millimeter wave components developed for the local vertical sensor are discussed, with emphasis on the antenna, low noise mixer, and solid-state local oscillator. A vis-ble sensing technique exists, useful over a wide range of altitude with an accuracy generally in the order of 0.01 degree or better. (Woodard-USGS) W73-10743

Field 07—RESOURCES DATA

Group 7B-Data Acquisition

WOODY PHREATOPHYTES ALONG THE BRAZOS RIVER AND SELECTED TRIBUTA-RIES ABOVE POSSUM KINGDOM LAKE, Texas Tech Univ., Lubbock. Dept. of Range and Wildlife Management.
For primary bibliographic entry see Field 03B.

WAVE ESTIMATES FOR COASTAL REGIONS, Army Coastal Engineering Research Center, Washington, D.C. For primary bibliographic entry see Field 02J. W73-10751

CURRENTS AND SEDIMENT TRANSPORT AT THE WILMINGTON CANYON SHELFBREAK, AS OBSERVED BY UNDERWATER TELEVI-SION, Smithsonian Institution, Washington, D.C. Div. of Sedimentology.

For primary bibliographic entry see Field 02J.

W73-10772

FILTERS WITH A CONSTANT MOISTURE POTENTIAL AT THE SURFACE (FILTRY S POSTOYANNYM POTENTSIALOM VLAGI NA

POVERKHNOSTI), Vsesovuznyi Nauchno-Issledovatelskii Institut Torfyanoi Promyshlennosti, Leningrad (USSR). For primary bibliographic entry see Field 02G. W73-10774

AT-STREAM-VELOCITY PUMPING SEDI-MENT SAMPLING SYSTEM, Geological Survey, Fort Collins, Colo. For primary bibliographic entry see Field 02J. W73-10992

DETECTORS FOR MEASUREMENT OF WATER POLLUTION. For primary bibliographic entry see Field 05A. W73-11016

7C. Evaluation, Processing and Publication

SYNTHESIS AND EVALUATION OF URBAN-R-EGIONAL HYDROLOGIC RAINFALL-RUNOFF Environmental Dynamics, Inc., Los Angeles, Calif.

For primary bibliographic entry see Field 02A. W73-10416

A FINITE ELEMENT SOLUTION FOR TWO--DIMENSIONAL DENSITY STRATIFIED FLOW Water Resources Engineers, Inc., Walnut Creek, Calif

For primary bibliographic entry see Field 02H. W73-10418

THE APPLICATION OF MULTI-ATTRIBUTE SCALING PROCEDURES TO THE DEVELOPMENT OF INDICES OF VALUE, Michigan Univ., Ann Arbor. Engineering Psychology Lab. For primary bibliographic entry see Field 05A. W73-10464

MEASUREMENT OF CURRENT AND POTEN-DISTRIBUTION AT ROTATING-DISK ELECTRODES, Bell Telephone Labs., Inc., Murray Hill, N.J. For primary bibliographic entry see Field 07B.

(CALIFORNIA COMPREHENSIVE OCEAN AREA PLAN). APPENDIX I: PERMANENT COASTAL ZONE DATA INVENTORY AND IN-FORMATION SYSTEM, California State Dept. of Navigation and Ocean

Development, Sacramento. R. A. Nash.

Nov 30, 1970. 137 p, 10 fig, 7 tab, 19 ref. HUD sup-

Descriptors: *California, *Coasts, *Data collections, *Data processing, *Information exchange, Planning, Management, Systems analysis.

A permanent data inventory and information system is necessary to the support of essential decisions for planning and managing the California coastal zone. Recommendations for establishment and operation of an automated system are given. and operation of an automated system are given.

The required data are available from local, state, and federal agencies. The inventory and information system could be made available within two years after funding approval. (Ensign-PAI)

W73-10552

STOCHASTIC MODELS APPLIED TO OPERA-TION OF RESERVOIRS IN THE UPPER COLORADO RIVER BASIN IN TEXAS, Texas A and M Univ., College Station. Water

For primary bibliographic entry see Field 02A. W73-10565

PROCEEDINGS OF THE 1971 OSTAC ANNUAL MEETING, STATE DEPARTMENT, WASHING-TON, D.C. 2-3 JUNE 1971. For primary bibliographic entry see Field 05G. W73-10570

SIDE-LOOK RADAR PROVIDES A NEW TOOL FOR TOPOGRAPHIC AND GEOLOGICAL SUR-VEYS, Westinghouse Defense and Electronic System Center, Baltimore, Md. For primary bibliographic entry see Field 07B.

DATA ON SELECTED LAKES IN WASHING-TON, PART I, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 02H. W73-10654

W73-10615

THE APPLICATION OF A SIMPLE RAINFALL--RUNOFF MODEL TO A CATCHMENT WITH INCOMPLETE DATA COVERAGE, Swedish Meteorological and Hydrological Inst., Stockholm.
For primary bibliographic entry see Field 02A.

W73-10656

MATHEMATICAL SIMULATION OF THE SUB-SIDENCE OF VENICE: 1. THEORY, Centro di Ricera IBM di Venezia (Italy) For primary bibliographic entry see Field 02F. W73-10663

THE WATER RESOURCES PROGRAMS OF THE U.S. GEOLOGICAL SURVEY, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02E. W73-10674

AN ON-SITE HYDROLOGIC DATA RECORD-ING SYSTEM, Utah Water Research Lab, Logan For primary bibliographic entry see Field 07B.

W.A.L.R.U.S. I WATER AND LAND RESOURCE UTILIZATION SIMULATION,
Michigan Univ., Ann Arbor. School of Natural
Resources. For primary bibliographic entry see Field 06A. W73-10735

CSS: A COMPUTER PROGRAM FOR MODEL-ING ECOLOGICAL SYSTEMS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 06A. W73-10736

COMPARATIVE STUDY OF RESOURCE A COMPARATIVE STUDY OF RESOURCE ANALYSIS METHODS, Harvard Univ., Cambridge, Mass. Dept. of Land-scape Architecture. For primary bibliographic entry see Field 06A. W73-10737 Atiti mti olafi C wcl si in W

60 GHZ RADIOMETRIC LOCAL VERTICAL SENSOR EXPERIMENT, Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Systems Development Div. For primary bibliographic entry see Field 07B. W73-10743

DISTRIBUTION OF MORE IMPORTANT COM-PLEX BIOMETEOROLOGICAL INDICES PLEX BIOMETEC OVER THE GLOBE, For primary bibliographic entry see Field 02B. W73-10816

OPTIMAL FEEDBACK CONTROL - A SYNOP-SIS, Kansas State Univ., Manhattan. Inst. for Systems

Design and Optimization.

N. C. Pereira, L. T. Fan, and C. L. Hwang.

Report 29, Kansas Water Resources Research Institute Contribution No. 66, 1971. 40 p, 29 ref.

OWRR A-038-KAN (2). 14-31-0001-3216.

Descriptors: *Dynamic programming, *Control systems, Model studies, *Optimization, Mathematical models, Mathematical studies. Identifiers: *Optimal feedback control theory, Linear systems, Nonlinear systems.

The development of optimal feedback control theory through continuous dynamic programming and the continuous maximum principle is presented. The development initially deals with linear systems and is then extended to nonlinear systems and distributed parameter systems. The applications of theoretical results are illustrated by means of selected simple examples from the literal means of selected simple examples from the litera-W73-10887

THE MODELLING OF THE ECOSYSTEM OF LAKE DALNEE ON AN ELECTRONIC COM-PUTER, ary bibliographic entry see Field 05C. For primar W73-10899

HYDROLOGIC MODELING, PARAMETER ESTIMATION, AND WATERSHED CHARAC-TERISTICS, Georgia Inst. of Tech., Atlanta. For primary bibliographic entry see Field 02A. W73-10964

INFORMATION CONTENT OF TIME-VARIANT INFORMATION CONTENT OF TIME-VARIANT DATA,
Nevada Univ., Reno. Dept. of Civil Engineering.
V. L. Gupta.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9615, p 383-394, March 1973. 4 fig, 1 tab, 14 ref, append. OWRR A-049-NEV (1).

Descriptors: *Data collections, *Hydrologic data, Descriptors: "Data confections," Hydrotogic data, 'Statistical methods, Sampling, Data processing, Data storage and retrieval, Model studies, Stream gages, Gaging stations, Variability, Correlation analysis, "California. Identifiers: Eel River Basin (Calif).

A method is presented for the delineation of op-timal sampling frequencies in discrete data aquisi-tion programs in the fields of hydrology and water resources. Statistical treatment and the implicaresources. Statistical treatment and the implica-tions of information content are discussed in terms of the variability of sample mean and sample vari-ance. The method is illustrated with three stream-flow gaging stations in the Eel River basin, California. The variation of information content with sampling interval yields guidelines for the choice of a sampling frequency such that per-sistence effects and the consequent redundancy of information are minimized. (Knapp-USGS)

WATER RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1972. Geological Survey, Washington, D.C.

Report of Investigations Folder, 1973. 1 sheet, 7

Descriptors: Water resources, Investigations, *Inter-agency cooperation, *North Dakota, *Surveys, Planning, Hydrologic data, Basic data col-lections, Precipitation (Atmospheric), Ground-water, Water quality, On-site investigations, Dis-solved solids, Water level fluctuations, Bibliogra-phies, Networks, *Maps, Streamflow. Identifiers: *Cooperative water-studies program, Research projects.

Research projects.

Water-resources studies and investigations in water-resources studies and investigations in North Dakota made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretive studies, and research projects. The hydrologic data network consists of projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small State maps show principal sources of ground-water, average annual precipitation, discharge of the principal rivers, and the dissolved solids in surface waters. A map, scale 50 miles to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in progress as of November 1972. (Woodard-USGS) W73-10980

IRRIGABILITY CLASSIFICATION OF SOILS, (IRRIGABLE SOILS OF NEVADA). For primary bibliographic entry see Field 03F. W73-10983

RECONNAISSANCE OF THE MANISTEE RIVER, A COLD-WATER RIVER IN THE NORTHWESTERN PART OF MICHIGAN'S SOUTHERN PENINSULA, Geological Survey, Washington, D.C. G. E. Hendrickson, and C. J. Doonan. Geological Survey Hydrologic Investigations Atlas HA-436, 1972. 2 sheets, 15 fig. 5 ref.

Descriptors: "Hydrologic data, "Streamflow, "Water quality, "Michigan, Water properties, Data collections, Recreation facilities, Cold-water fishing, Trout, Stream gages, Flow measurement, Water yield, Water analysis, Chemical analysis, "Maps, Curves, Geology, Groundwater move-ment, Base flow. Identifiers: "Manistee River (Mich).

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The Manistee River is one of Michigan's well-known trout streams because of its numerous

public access sites and campgrounds. The recreational values of the Manistee depend on its characteristics of streamflow, water quality, and bed and banks. This atlas describes these characteristics and shows how they relate to recreational use. The Manistee River basin above Smithville drains an Manistee River basin above Smithville drains an area of about 500 square miles. More than half of this area is outwash plains underlain by permeable soils and glacial drift. The rest of the basin is chiefly rolling to hilly, topography characteristic of glacial moraines. The large component of groundwater flow makes the Manistee a stable stream with relatively small fluctuations in discharge and stage. The average monthly discharge in cfsm at the Gravling sage ranges from stream with relatively small fluctuations in discharge and stage. The average monthly discharge in cfsm at the Grayling gage ranges from 1.37 in April to 1.07 in August. This is the smallest variation in monthly discharge recorded for any stream in Michigan's southern peninsula. The water is of the calcium-bicarbonate type, moderately hard, and low in sulfates and chlorides. (Woodard-USGS)

WATER-TEMPERATURE DATA ACQUISITION ACTIVITIES IN THE UNITED STATES, Geological Survey, Washington, D.C. Office of Water Data Coordination.

Water Data Coordination.
F. H. Pauszek.
Available from NTIS, Springfield, Va 22151. PB-213 972. Price \$3.00 printed copy; \$0.95 microfiche. Geological Survey Water-Resources Investigations 2-72, 1972. 47 p, 16 fig, 8 tab, 92 ref.

Descriptors: "Water temperatures, "Surface waters, "Groundwater, "United States, Sites, Federal government, Data collections, Measurement, Streams, Rivers, Lakes, Reservoirs, Estaincies, Water wells, Springs, Reviews, Information Identifiers: *Water-temperature measuring sites

(US).

ation on water-temperature measuring sites in the United States is presented by means of ta-bles and illustrations preceded by brief explana-tions. Included are the agencies collecting the data, the number of stations located on surface waters and groundwaters where temperature m waters and groundwaters where temperature mea-surements are made, the distribution of stations by states and by the 21 regions of the Water Resources Council (WRC), a federal agency created in accordance with the Water Resources created in accordance with the water Resources Planning Act of 1965, and the frequency of mea-surements. The report does not contain the actual temperature data. A bibliography lists 194 references which contain temperature data. (Woodard-USGS) W73-10986

A TEST OF EQUALITY OF MEANS OF CORRELATED VARIATES WITH MISSING DATA ON

ONE RESPONSE, Pennsylvania Univ., Philadelphia.

D. F. Morrison Biometrika, Vol 60, No 1, p 101-105, April 1973. 1

Descriptors: *Statistical methods. Identifiers: *Hypothesis testing, *Missing data, Testing, Paired t statistics, Mean values.

A statistic is proposed for testing the hypothesis of equality of the means of a bivariate normal dis-tribution with unknown common variance and cor-relation coefficient when observations are missing at random on one of the variates. Expressions for the second and fourth moments of the statistic have been obtained, and normal, t and Cornishhave been obtained, and normal, t and comman-fisher approximations to the percentage points under the null hypothesis have been found from them. The expected squared lengths of the con-fidence intervals for the mean difference have been used to measure the additional sensitivity of ne test over that of the conventional paired t. (Lit-

A TWO-SAMPLE PROCEDURE FOR SELECT-ING THE POPULATION WITH THE LARGEST MEAN FROM SEVERAL NORMAL POPULA-TIONS WITH UNKNOWN VARIANCES, Bath Univ. of Technology (England).

etrika, Vol 60, No 1, p 117-124, April 1973. 5

Descriptors: Statistical methods.
Identifiers: "Two-sample procedure, "Mean values, Best normal population.

A two-sample procedure is described for selecting the population with the largest mean from k normal populations with unknown variances. The method is based on a two-sample procedure proposed by Stein (1945). Tables necessary for the application of the procedure are given for selected values of k. Comparisons of the minimum values of the expected sample sizes using the proposed procedure are made with the corresponding single-sample sizes for known variances (Bechhofer, 1954). Comparisons are also made of the expected total sample sizes for the single-sample procedure, two-sample procedure given and the two-sample procedure proposed by Bechhofer, Dunnett and Sobel (1954) which assumes that the populations have known variance ratios. The expectations have known variance ratios. tions have known variance ratios. The expected total sample sizes are not much increased by ignorance of the variance ratios. (Little-Battelle) W73-11014

THROUGH THE MINI MAZE. Interdata, Inc., Oceanport, N.J. J. Folts. Automation, Vol 20, No 2, p 44-48, February 1973.

Descriptors: *Data collections, *Real costs, Descriptors: "Data couections, "Aeal coase, "Monitoring, "Data processing, Equipment, Water pollution, Automatic control, Design criteria, In-dustrial production, Methodology, Cost analysis, Automation, Instrumentation, Specifications. Identifiers: "Minicomputers, Performance evalua-

A discussion is presented which represents an ef-A discussion is presented which represents an en-fort to give those researchers interested in using minicomputers some idea of the real costs of mini systems and the hidden pitfalls of minicomputer application. The applications considered are those in which (1) no changes are made in the mini system without first taking it off-line; (2) mul-tifunctional tasks are considered and the applica-tion someways are altered or vended while the tion programs are altered or replaced while the system is still on-line; and (3) multifunctional tasks aystem is stui on-line; and (3) multifunctional tasks involve incorporating on-line interaction with terminals and the ability to change application programs while simultaneously performing background computations. Extensive record-keeping and summary report constraints in all of the programmers of the programmer in the programmer in the programmer is all of the programmers. performing performing and summary report generation is also involved. Three classes of machines that will provide the 'computer horsepower' to perform the above tasks are described and assessed on the basis of costs and performance. In addition, the pitfalls of system design are discussed. (Holoman-Battelle) W73-11015

AN ESTIMATOR FOR THE SIZE OF AN ANIMAL POPULATION, Birkbeck Coll., London (England). P. Holgate.

Biometrika, Vol 60, No 1, p 135-140, April 1973. 7

Descriptors: *Statistical methods, *Animal populations, *Estimating, Age, Mortality.
Identifiers: *Data interpretation, Bias, Variance.

A method of estimating animal populations which is popular among zoologists is to take the total of the ages of animals that die during a given year as an estimator of population size. In this note the estimator of population size. In this note the

Field 07-RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

for a stationary model, and for one based on a branching process. A numerical illustration is given. (Little-Battelle) W73-11017

FOCUS ON A/D AND D/A CONVERTERS, D. N. Kave.

Electronic Design, Vol 21, No 1, p 56-65, January

Descriptors: *Automatic control, *Specifications, *Design data, *Data collections, Electrical equipment, Instrumentation, Design criteria, Automation, Electrical converters, Performance.

Identifiers: "Analog-to-digital converters,
"Digital-to-analog converters, Accuracy,
Weighted-resistor d/a converters, R-2R d/a converters, Dual-slope integration a/d converters, Successive approximation a/d converters.

Analog-to-digital and digital-to-analog converters are discussed in reference to their circuitry, modes of operation, and other specifications. The vast majority of d/a converters on the market today use two basic circuits: the weight-resistor network and the R-2R configuration. These two types are most conveniently described for the case of a voltageoutput d/a-that is, the case where a digital input yields a discrete voltage level at the output. As with d/a converters, the vast majority of a/d converters on the market comprise two basic types: the dual-slope integration a/d converter and the successive approximation a/d converter. Each takes a voltage input and puts out a digital code proportional to the input voltage. A/d specifications are similar to d/a specifications, a main difference being the output of a series of digital codes by an a/d converter. Manufacturers of converters of various specifications and costs are listed. (Holoman-Battelle) W73-11018

DIGITAL-TO-ANALOG CONVERTER HAVING COMMON-MODE ISOLATION AND DIF-FERENTIAL OUTPUT, IBM General Systems Div. Lab., Boca Raton, Fla.

G. A. Hellwarth, and S. Boinodiris.

IBM Journal of Research and Development, Vol 17, No 1, p 54-60, January 1973, 7 fig. 1 tab, 8 ref.

Descriptors: *Automatic control, *Data collections, *Data processing, Instrumentation, Data storage and retrival, Electrical properties, Electrical equipment, Computers, Automation, Electric converters, Electrical networks, Electrical impedance, Direct currents.

Identifiers: *Digital-to-analog converters, *Com-mon-mode isolation, *Differential output, Per-formance evaluation, Accuracy, Noise (Elec-tronics), Noise (Environmental).

A digital-to-analog converter (DAC) is described that has transformer-coupled isolation for both power and data inputs and provides a true dif-ferential output. The DAC provides a 10-bit, 10.23-V unipolar output of either polarity, depending on which of the two output lines is used as the load reference potential. The common mode potential may be as large as 250 V, and below 120 Hz the non-mode rejection typically exceeds 100 dB. The isolated, balanced circuit eliminates environmental noise problems and permits long cabling lengths without loss of dc accuracy. The DAC is an analog output feature available on the IBM System/7, a small computer designed for data acquisition and real-time automation applications. (Holoman-Battelle)

08. ENGINEERING WORKS

8A. Structures

THE SAN FERNANDO EARTHQUAKE: A LES-SON IN HIGHWAY AND BRIDGE DESIGN, California State Div. of Highways, Sacrament A. L. Elliott.

Civ Eng, Vol 42, No 9, p 95-97, Sept 1972. 1 fig, 6

Descriptors: *Bridge design, *Bridge failure, Joints (Connections), Earthquakes, Bridges, Earthquake engineering, Seismic design, Structural design, Seismology, Seismographs, Columns, Reinforced concrete, *California. Identifiers: *San Fernando earthquake, *Highway bridges, Earthquake damage, *Earthquake-resistant structures.

In the San Fernando Valley of California, on February 9, 1971, an earthquake destroyed many earthquake-resistant structures in just 12 seconds. With many recording instruments in the area, en-gineers were able to learn the structural reactions to earthquake forces. Most obvious was that structures located in the disruptive center are inevitably
subject to severe structural damage. Designing to
prevent all damage is neither feasible nor economical, but sound designs should be used to prevent
total collapse of the structure. Remedies for 6
structural weaknesses are discussed. Recommended design modifications are: (1) concrete
columns with heavier and closer spaced continuous spiral reinforcing; (2) expansion joints with
restraints for large movements; (3) no lap splices
in main column bays for columns less than 30 ft
high; (4) better anchorage of piles in footings; (5)
better keying and lateral restraint at abutments;
and (6) dynamic analysis that considers
earthquake motion, structural response, and foundation materials. (USBR) to earthquake forces. Most obvious was the

RAW WATER TRANSMISSION SYSTEM FOR SPRINGFIELD, MASS., Hazen and Sawyer, New York. W. B. Sinnott, and S. S. W. Yuan.

Transportation Engineering Journal, Proceedings of the American Society of Civil Engineers, Vol 97, No TE3, p 459-467, August, 1971. 9 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Water supply, *Water conveyance, Project planning, *Hydraulic design, Computer models, Simulation analysis, *Massachusetts,

Identifiers: *Springfield (Mass), Waterhammer, Cobble Mountain Reservoir, Littlefield Reservoir.

Because of the drought in the northeastern United States during 1961-1966, many cities began looking for additional sources of water supply. The City of Springfield decided to use water available in a new Springfield decided to use water available in a new reservoir constructed by the Army Corps of Engineers (for flood control purposes) and to divert this water, about 60 mgd, to the city's Cobble Mountain Reservoir. The article focuses on the design of the water conveyance system between the two reservoirs. A particular problem involved in the operation of the system was waterhammer transients (pressure in the pipes) due to the length of the lines and the great amount of pumping involved. Computer simulations and field tests aided in determining an optimal system of values to control the waterhammer transients. Effers-North in determining an optimal system of values to con-trol the waterhammer transients. (Elfers-North Carolina) W73-10687

NEW ACOUSTIC TOOL LOGS CASED HOLES, Pan Geo Atlas Corp., Houston, Tex. D. M. Muir, and W. A. Zoeller.

Oil and Gas Journal, Vol 65, No 43, p 106-112, October 23, 1967. 10 fig.

Descriptors: Boreholes, Well casing, *Logging (Recording), Cement grouting, Grouting, *Nuclear moisture meters, *Acoustics, Wells, Texas, Velocity. Identifiers: Formation evaluation, Formation-travel (Sound) times.

An improved acoustic tool is described which makes it possible to obtain porosity and lithology data from cased wells, while at the same time making it possible to evaluate the cement condition from the data recorded. In most situations, no more than 40 to 50% cement bond is required for accurate recording of formation - travel times. Under certain fast-velocity-formation conditions, accurate time logs have been obtained with an even smaller percentage of bonding. The equipment permits simultaneous recording of the acoustic, gamma ray, neutron, caliper, and collar logs. The acoustic tool is primarily a transmitting transducer positioned above two or more receiving transducers. The formation signal consisting of time and amplitude, is recorded in travel time by use of a complex measuring. The epithermal-neutron tool's response is a measure of hydrogen present within the investigated section. Neutron charts are available for determining porosity using different annulus vs. casing sizes. Logs for the three main conditions which may exist in a borehole after cementing are shown. (Campbell-NWWA) NWWA) W73-10705

SURFACE-HOLE TECHNIQUES SHOULD BE SIMPLE AND CHEAP, Oklahoma Univ., Norman.

Oklandina Giav., 1703. Mail.

P. L. Moore.
Oil and Gas Journal, Vol 66, No 47, p 173, 176, 179, November 18, 1968. 2 fig.

Descriptors: Drilling, *Rotary drilling, Drilling fluids, Drilling equipment, Bentonite, Florculation, Costs, *Economic justification, *Exploration, Oil industry, Offshore platforms. Identifiers: Drilling rates.

The reduction of drilling costs has become a major issue in the oil and gas exploration industry. This has been caused by the finding of new reserves in difficult-to-drill areas, such as permafrost, rough sea, and very deep localities. Generally, the best sea, and very deep localities. Generally, the best drilling practices are those where simplicity is emphasized. Several rules-of-thumb having general application to surface hole techniques are: (1) If more lift is needed, flocculate the mud; (2) Do not use chemical thinners, because they reduce lift capacity; (3) Don't worry about water-loss control; (4) Keep mud weights low-at least below 9.5 lb/gal and preferably 9.0 lb/gal or below; (5) Don't use high-priced thickening agents. Hole enlargement in the surface hole is a common problem, as are torque and formation-beaving problems. The remedy is to increase lifting capacity of the drilling fluid by increasing the viscous properties of the mud, or to slow down drilling. (Smith-NWWA) W73-10706

HOW CONDITIONS AFFECT REACTION RATE OF WELL-TREATING ACIDS, Marathon Oil Co., Denver, Colo. H. K. Van Poolen, and J. R. Jargon. Oil and Gas Journal, Vol 66, No 43, p 84-91, Oct 21, 1968. 15 fig, 1 tab, 24 ref.

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Descriptors: *Acids, Acidity, Limestones, Dolomite, Calcium carbonate, *Carbonates, Calcium chloride, Temperature, *Chemical reactions, Pressure, Carbon dioxide, Hydrogen ion concen-

Identifiers: *Acidizing, Weak acids, Hydrochloric acid, Buffers, Common ion effect, *Reaction rate.

The velocity of the chemical reaction which occurs during an acid treatment determines, to a great extent, the rate at which the acid should be pumped into the formation. Factors which influence the reaction rate-type of acid, formation composition and structure, pressure, temperature, acid concentration, acid velocity, and the formation of secondary products—are studied. The discussion is limited to limestone and dolomite, although some carbonate-cemented sandstone although some carbonate-cemented sandstone although some carbonate and HCl is reduced by the common ion effect as explained in an accompanying table. Weak acids', such as acetic, formic, benzoic, and lactic acids, are sometimes used in order to slow reaction rate. The partial neutralization of a weak acid forms a buffer solution which prevents a too-rapid rise in pH from occurring. Equalization of the reaction rates between HCl and limestone and HCl and dolomite is discussed. (Campbell-NWWA) NWWA) W73-10707

WELL LEVEL MEASUREMENT METHODS. Maguire (Charles A.) and Associates, Boston, Mass.

rimary bibliographic entry see Field 08G.

NOTES ON DEVELOPING GROUND WATERS, International Water Supply Association, Montreal (Quebec). ary bibliographic entry see Field 04B.

WELL OPERATION, Madison Water Utility, Wis. L. M. Nelson. Journal of the American Water Works Associa-tion, Vol 62, No 7, p 436-438, July 1970.

Descriptors: Wells, *Water wells, Municipal water, Groundwater, *Well data, Pumps, *Water supply, Water sampling, Chlorination, Disinfection, Specific capacity, Drawdown, *Maintenance, Hardness (Water), Chemical analysis. Identifers: Submersible pumps, Turbine pumps, *Pacaretres*

*Records.

In the operation of wells, a number of factors are involved to maintain a pure and adequate water supply. A durable water-tight casing should line the well to a depth of the first impervious rock formation. The well water should be continually checked by means of water sampling to insure freedom from bacterial contamination. If samples show no signs of bacterial contamination the water is safe for public use; if the samples indicate pollution, disinfection with chlorine should be used and, if repeated, a search made for the source of contamination. Selection and maintenance of well pumping equipment is another factor. Submersibles and deep-well turbine pumps are the two types generally used in deepwell application. Before a pump can intelligently be selected for any installation, it is necessary that accurate information by available with regard to required capacity, operating conditions and total head. Another factor in well operation is the keeping of good well water supply records. Daily, monthly, and yearly records should be kept of static levels, drawdown, pumping levels, specific capacity, gallons per minute, hours of operation, kilowatt hours and amount of chemicals fed. (Smith-NWWA) W73-10714

CONTROLLING FLOWING ARTESIAN Bureau of Reclamation, Denver, Colo. Div. of Drainage and Groundwater Engineering. T. P. Ahrens.

Water Well Journal, Vol 23, No 3, p 18-19, March

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Descriptors: Wells, Water wells, *Artesian wells, Artesian heads, *Cement grouting, Drilling fluids, Beatonite, Grouting, Well casing, Sturries. Identifiers: Annular space, Well packers, *Flowing artesian wells, Ontario.

ang artesian wells, Ontario.

A number of methods are available to control artesian flows which occur after a well is drilled. Factors determining which method is to be used are: stratigraphy of the area; depth, diameter, and design of the well, including location of perforations; method of construction of the well; and pressures and volumes of flow encountered. A procedure for controlling three Canadian wells is outlined. Basically, the method consists of using a bentonite mud to temporarily completely shut off the flow of water in both casing and annular space, and then displacing the mud with cement from the bottom by means of a perforated drop pipe. It is emphasized that all equipment and materials should be assembled at the work site in order that the cement be placed before the mud gels. If the mud gels, higher pumping pressures are required for displacement of the mud. Although not inexpensive, this procedure should be cheaper than drilling a new well. (Campbell-NWWA)

EFFECTIVE MIXING IN SHALLOW BODIES OF WATER WITH AND WITHOUT DENSITY STRATIFICATION, Utah State Univ., Logan. For primary bibliographic entry see Field 05D. W73-10719

ACIDIZING BOREHOLES,

A. H. Stow, and L. Renner.

Journal of the Institution of Water Engineers, Vol. 19, No 8, p 557-572, November, 1965. 1 fig, 5 ap-

Descriptors: Wells, Water wells, *Acids, Carbonates, *Carbonate rocks, Sandstones, *Boreholes, Phosphorus compounds, Inhibitors, Grouting, Cement grouting, Limestone, Drilling, Identifiers: Chalks, *Acidizing, *Development (Wells), Hydrochloric acid, Acetic acid, Phosphoric acid, Nitric acid.

Acid may be used in water well work to (1) Remove debris (from drilling) from test-pump discharge; (2) Remove shurry from the walls of a well or borehole, and to clear fissures at their entry into the well or borehole; (3) Develop and increase the yield; (4) Reduce friction loss to give crease the yield; (4) Reduce friction loss to give more economic pumping. The reaction of acids with carbonates may be used to develop and to increase the yield of both carbonates and some (carbonate-semented) sandstones. In considering the acidizing of a borehole, the following information is required: Dimensions of the borehole, depth to static water level, depth of grouted lining, details of overburden, geological description of exposed strata, yield and direction and velocity of groundwater flow, positions of boreholes within a 1/2 mile radius, and facilities for disposal of test-pumping water. Inhibitors and placement procedure are discussed; various acids and their properties are given in appendices. (Campbell-NWWA) W73-10787

A NEW MATERIAL TO CEMENT WELL CAS-

ING, Cities Service, Co., Corpus Christi, Tex. For primary bibliographic entry see Field 08F. W73-10788

EFFICIENCY OF VARIOUS METHODS OF DRILLING WELLS FOR WATER SUPPLY, A. G. Danilov, A. M. Danilov, and V. I. Kovalev. National Water Wells Association Translation. Trans. from Gidrotekhaika i Melioratsiya, p 91-95, February, 1973. 2 fig, 3 ref.

Descriptors: Wells, *Water wells, Drilling, *Drilling equipment, Drilling fluids, Drilling samples, *Rotary drilling, Unconsolidated aquifers, Hydrogeology, Exploration.
Identifiers: *Cable-tool drilling, USSR.

In drilling for water, the yields (water yield measured in gpm/ft. of drawdown) of wells drilled by the cable tool method were 4 - 10 times greater than the yields of those drilled by the rotary method. The rotary method showed a drilling rate (meters/machine-month) only 2.5 - 3.0 times higher than that with eable tools. In detailed hydrogeological exploration for defining the problems in obtaining a water supply for irrigation and drainage in districts where the aquifer is unconsolidated and fragmentary (river valleys, foothills, interfluves, etc.) the cable tool method is economical and ensures a high quality of hydrogeological information and a large well yield. In hydrologically well-explored districts where the aquifers lie at depths of from 300-800 meters and have high artesian pressures the rotary method should be applied. (Smith-NWWA)

WELL STIMULATION-HOW ACIDS BEHAVE

WELL STIMULATION—HOW ACIDS BEHAVE IN SOLUTION, Marathon Oil Co., Tex. H. K. VaaPoolen. Oil and Gas Journal, Vol 65, No 39, p 100-102, September 25, 1967. 1 tab, 2 ref.

Descriptors: "Acids, Oil industry, Wells, Ions, "Ionization, Calcium chloride, Calcium sulfate, Iron, Aluminum, Sodium compounds, "Chemical precipitation, Chemical reactions, Equations, Equilibrium, "Hydrogen ion concentration. Identifiers: Sequestering agents, Weak acids, Buffered solutions, Hydrochloric acid.

Problems and solutions of acidizing boreholes to increase yield are given. The pH of solutions in general and of weak acid solutions is explained, along with why careful pH control is sometimes very important. Secondary precipitation, the dissolution of certain substrances in fresh acid and precipitation of these materials when the acid becomes spent, is explained, and substances precipitation of these materials when the acid becomes spent, is explained, and substances which may give trouble in this regard are listed. The use of buffers to prevent the pH of a solution from rising above a critical value causing the secondard precipitation of iron or aluminum is outlined. Another approach to the problem of secondary precipitation, with calcium sulfate, is the prevention of the initial dissolution of calcium by the common ion effect. The control of secondary precipitation may also be accomplished by reduction of the cation concentation below the level necessary to cause precipitation. This is accomplished by the use of a sequestering agent which, for calcium sulfate, is sodium hexametaphosphate. (Smith-NWWA)

WELL DRILLING IN SOUTHEAST ASIA, Camp, Dresser and McKee, Boston, Mass. R. E. Preble. New England Water Works Association Journal, Vol 85, No 2, p 132-138, (1971). 2 fig.

Descriptors: Wells, Water wells, Drilling, *Drilling equipment, *Asia, Rotary drilling, History, Groundwater, *Groundwater availability, Deltas, Unconsolidated aquifers. Identifiers: *Developing countries, Cable tool drilling, Reverse-circulation rotary, Manual labor.

Problems related to groundwater development in Asia include (1) Scarcity of basic geological information for planning; (2) Insufficient number of qualified professionals; (3) Inadequate road network; and (4) Shortage of parts and supplies for drill rigs and accessories. Although in recent years most countries of S. E. Asia have started to employ modern equipment and techniques, many

Field 08—ENGINEERING WORKS

Group 8A—Structures

wells today are still being installed by centuries-old hand methods. Methods of well drilling without power-driven equipment are explaine detail. Success of hand methods depends u conditions encountered. The reverse ro ined i ads upon conditions encountered. The reverse rotary process is the ideal power operated method of drilling wells in flat deltaic areas of the region's major rivers. In developing countries, standard size wells are generally constructed with the same screen diameter regardless of the desired pumping rate. Often, this leads to excessive drawdowns and unnecessary power costs. (Smith-NWWA) W73-10795

DRILLING FOR WATER IN NEW ENGLAND, Geological Survey, Montpelier, Vt. A. L. Hodges, Jr. New England Water Works Association Journal, Vol 82, No 4, p 287-315, December, 1968. 10 ref.

Descriptors: Wells, Water wells, *Drilling, Drilling deulpment, Unconsolidated aquifers, Rotary drilling, Well casings, Wells screens, Ground-water, "Groundwater availability, "Water supply development, Water table aquifers, Deep wells, Pumps, Gravels, "Northeast U.S.

Identifiers: Rock wells, Crystalline rocks, Sedi-mentary rocks, *Yields of wells, Well develop-

The down-the-hole hammer, or rotary percussis method of drilling has gained rapid acceptance New England since its inception in the 1950's a today supplements to a great extent the older cab tool method. Test drilling as a method for choosin the best location for a water well is recommended. The relative advantages and disadvantages of un-consolidated and consolidated aquifers, where both types are available, are given. Types of hole both types are available, are given. Types of hole excavation for wells covered include dug wells, driven wells, jetted wells, bored wells, infiltration galleries, well fields of the aforementioned, and drilled wells constructed by various methods. Methods of casing and screen emplacement covered include the retracted-casing method, the baildown method, and the washdown method. Gravel packing is discussed in detail. A summary of yields of wells in various rock types is given. Gravel packing is discussed in detail. A summary of yields of wells in various rock types is given. Well development methods, including overpumping, surging, dry ice, compressed air, and horizonal jetting, are discussed. A section on water well pumps includes discussions on pump types and pump selection. (Campbell-NWWA) pump selec W73-10796

WELL DEVELOPMENT OF SAND AND GRAVEL AQUIFERS, D. Ault, and R. N. Bethart

Water Well Journal, Vol 23, No 3, p 20-22, March, 1969, 2 fig.

Descriptors: Groundwater, Gravels, *Unconsolidated aquifers, Well screens, *Particle size, Sand aquifers, Acids, Pumping, Jets, Wells, *Water wells

Identifiers: *Well development, Bridging (Particles), Compressed air.

Differing methods of development of sand and Drittering methods of development of sand and gravel aquifers are presented, each having its ad-vantages and disadvantages. Acid treatment is today often used in initial well development procedures and will clean up the formation for a considerable distance outside the well screen. A considerable distance outside the well screen. A solution of either dry or wet acid is prepared and introduced into the well, agitated several times during a 12 to 24 hour soaking period, and is flushed out thoroughly by pumping the well. Overpumping, or the pumping of a well at a higher capacity than that of the permanent pump, often works very well on large capacity wells, especially when used in conjunction with other well development methods. The use of compressed air is the beat method under certain conditions, but it requires the use of considerable equipment. A number of variations have been used when developing by air. Probably the most effective over-all method of well developing, however, is using water in a jet washing tool, which consists of directing high velocity streams of water at right an-gles into the formation. (Smith-NWWA) W73-10798

GROUNDWATER WELLS SERVE MINING IN-

DUSTRY, Universal Oil Products, St. Paul, Minn. Johnson

Div. G. F. Briggs.
Industrial Water Engineering, Vol 6, No 7, p 22-

Descriptors: Wells, Water wells, Mine water, *Mineral industry, *Dewatering, *Leaching, Kaolinite, *Georgia, Mineral water, Brines, Chlorides, Magnesium, Magnesium compousds, Well screens, Drawdown, Alloys, Corrosion, Transmissivity.

Identifiers: Nitric acid, Uranium ore, *Ore bodies.

Identifiers: Nitric acid, Uranium ore, "Ore bodies. Lowering the water table over an area to be excavated as an open pit involves creating a composite cone of depression by pumping from a series of properly spaced wells. An example of application of this technique is given in a Georgia kaolin mining pit dewatering project. Six dewatering wells were used, each pumping about 3,000 gpm, in order to lower the water table 55 to 60 ft. over an area 2500 ft by 600 ft. Inplace leaching of uranium ore is also discussed as another area in which ground water technology can be useful in the mining industry. A cold airtic acid solution containing an oxidant and flocculant is injected into the ore zone through injection wells located around a central recovery well. As the leaching solution is put into the injection wells, a cone-shaped, fluid-pressure mound builds up in the porous medium around each well. Pumping from the recovery well as toole at a rate equal to the total input of leach solution. This type of well application, of course, requires casing and screen materials which are highly corrosion resistant. An example where the mineralized formation water itself was a raw material-in this case 11 to 12% magnesium chloride-is also given. (Smith-NWWA)

8B. Hydraulics

A FINITE ELEMENT SOLUTION FOR TWO-DIMENSIONAL DENSITY STRATIFIED STRATIFIED Water Resources Engineers, Inc., Walnut Creek, For primary bibliographic entry see Field 02H. W73-10418

DIVIDING FLOW IN CLOSED CONDUITS, Beck (R. W.) and Associates, Seattle, Wash. J. V. Williamson, and T. J. Rhone. Paper, ASCE Natl Water Resour Eng Meet, Phoenix, Ariz, Jan 1971. 39 p, 14 fig, 26 ref, 2 ap-

Descriptors: *Head loss, Friction, Prototype tests, Energy loss, Velocity, *Closed conduits, Pressure conduits, Hydraulic models, Hydraulic design, *Hydraulic conduits, Reynolds number, Flow re-sistance, Bibliographies, Research and develop-ment Penstocks ent, Penstocks. *Wye Identifiers: Experimental models,

The paper constitutes a progress report by the ASCE Task Committee on Branching Conduits. A historical review of many investigations and general experiments on energy losses for dividing flow in hydraulic conduits is presented with extensive analyses. Laboratory research studies are

compared for symmetrical wye branches, manifolds, and standard and tapered branches. Special shapes are discussed. New designs by Escher Wyss and Krupp are described, and the results of field and laboratory studies are presented. The studies show that losses for 45- and 60-deg branches are not greatly different, but are less than for 90 deg. As the diameter ratio decreases, losses increase, but not significantly. Losses for conical wyes are generally less than those in single laterals. An internal tie rod or a spherical junction causes large losses it special inserts are not used to improve hydraulic efficiency. The angle of a conical transition should be between 10 and 15 deg for lesst loss. Prototype head losses are likely to be less than those obtained in model studies. (USBR) tained in m W73-10608

GUIDELINES FOR HYDRAULIC CONSIDERA-TIONS IN HIGHWAY PLANNING AND LOCA-

American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design.

American Association of State Highway Officials Publication, 1973. 4 p, 2 ref. Highway Drainage Guidelines: Vol. I.

Descriptors: "Road construction, "Road design, "Hydrologic aspects, "Hydrology, "Design criteria, Highways, Streams, Data collections, Hydrologic data, Floods, Flood frequency, Topography, Geology, Drainage effects, Vegetation, Mapping, Aerial photography, Land use, Reviews, Flanning, Identifiers: Guidelines, Highway locations.

Water and related climatic factors are important considerations in planning and locating highways. The effect of the highway construction on the ex-isting drainage pattern and on the potential flood hazard, as well as the effect of floods on the hazard, as well as the effect of floods on the highway, must be assessed in the preliminary planning and design stages. Often hydraulic factors are closely related to the environmental, ecological and economic aspects of the location of a new highway and critical evaluations must be made in the planning process, requiring compromises and a searching for alternate solutions and routes. Some drainage, flood, and water quality problems can be easily recognized and resolved: and routes. Some trainings, 1000s, and water quan-ty problems can be easily recognized and resolved; others may require extensive investigation before an adequate and satisfactory solution can be an adequate and satisfactory solution can be developed. Specialists experienced in hydrology and hydraulics can contribute substantially to the planning and location of a highway project by recognizing potentially troublesome locations, making necessary investigations, and recommending practical solutions. Hydrologic and hydraulic data, preliminary calculations and analyses, all information used in developing conclusions and recommendations related to drainage requirements, including estimates of structure size and location, should be compiled in a report. Such a report serves as documentation and back up for decisions on route location and is an excellent reference for more detailed studies needed in preparing construction plans. (See also W73-10658) (Woodard-USGS) W73-10657

GUIDELINES FOR HYDROLOGY. American Association of State Highway Officials, Washington, D.C. Operating Subcommittee on Roadway Design, y T

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American Association of State Highway Officials Publication, 1973. 23 p, 2 fig, 1 tab, 45 ref. Highway Drainage Guidelines, Vol 2.

Descriptors: *Road construction, *Road design, *Hydrologic aspects, *Hydrology, *Design criteria, Highways, Data collections, Streams,

Floods, Flood frequency, Topography, Geology, Drainage effects, Vegetation, Mapping, Aerial photography, Hydrologic data, Land use, Reviews, Planning. Identifiers: Guidelines, Highway locations.

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Identifiers: Guidelines, Highway locations.

Hydrologic analysis is a most important step prior to the hydraulic design of a highway drainage structure. Such an analysis is necessary for determining the rate of flow, runoff, or discharge that the drainage facility will be required to accommodate. The design discharge is a hydraulic load on the highway facility and the determination of the proper structural load. These guidelines give a recommended approach to the hydrologic analysis for the design of highway drainage facilities. Highway drainage facilities. Highway drainage facilities. Highway drainage facilities range from very amall culverts and channels to multimillion dollar storm drains and bridges. Although some hydrologic analysis is necessary for all highway drainage facilities, the extent of such studies should be commensurate with the importance of the structure. The documentation of a hydrologic canlysis is the compiliation and preservation of all pertinent information on which the hydrologic decision was based. This might include drainage area and other maps, field-survey information, source references, photographs, hydrologic calculations, flood-frequency analyses, stage-discharge data and flood history, which includes narratives from highway maintenance foremen and local residents who witnessed or had knowledge of an unusual event. (See also W73-10657) (Woodard-USGS)

EFFECTS OF TIME STEP SIZE IN IMPLICIT DYNAMIC ROUTING, National Weather Service, Silver Spring, Md. Of-fice of Hydrology. For primary bibliographic entry see Field 02E. W73-10676

COASTAL EROSION IN THE NILE DELTA, United Nations Educational, Scientific and Cul-tural Organization, New York. For primary bibliographic entry see Field 02J.

THE FEASIBILITY OF FLOW SMOOTHING STATIONS IN MUNICIPAL SEWAGE SEWAGE

Research Triangle Inst., Durham, N.C. For primary bibliographic entry see Field 05D. W73-10722

THE HEALTH AND CARE OF WELLS, Universal Oil Products, St. Paul, Minn. Johnson

Div. R. L. Schreurs. Journal of the American Water Works Associa-tion, Vol 62, No 7, p 434-436, July, 1970. 2 fig, 4 ref.

Descriptors: Wells, *Water wells, Groundwater, Well data, Well spacing, Iron bacteria, Iron oxides, Well screens, Graphical analysis, *Maintenance, Drawdown, Observation wells, Water levels, *Water lev vield, Pumping levels.

The longevity of a well depends on various factors—care used in construction, materials used, local geology and quality of groundwater, operation of the well, and maintenance. Causes of shortened well life include reduced pumping rate because of pump water or by a change in surface piping, lowering of the static water level, interference from nearby wells, lowering of the pumping level because of hydrologic influences, and clogging of the aquifer outside the well screen. An analysis of well problems using pumping rates and water levels plotted on graphs is shown. Pump

failure, chemical incrustation, bacterial clogging, and lowering of static level can be determined using graphic methods. Proper record keeping is emphasized as the most effective means of maintaining well performance and saving large expenses by making it possible to monitor slight changes in well performance and to take early corrective action. (Smith-NWWA) W73-10794

CORRELATED STUDIES OF VANCOUVER LAKE-HYDRAULIC MODEL STUDY, Washington State Univ., Pullman. R.L. Albrook Hydraulic Lab. For primary bibliographic entry see Field 05B. W73-10881

MAXIMUM BREAKER HEIGHT, Army Coastal Engineering Research Center, Washington, D.C. J. R. Wegel. Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 98, No WW4, Paper 9384, p 529-548, November 1972. 9 fig, 3 tab, 19 ref, 3 append.

Descriptors: *Coastal engineering, *Coastal struc-tures, *Ocean waves, *Breakwaters, Design criteria, Mathematical studies, Mass curves, Analytical techniques, Shore protection. Identifiers: *Ocean wave breakers, Maximum wave breaker height.

Based on a reevaluation of available experimental data on breaking waves, a relationship between the breaker height-breaking depth ratio, the incident wave steepness and the beach slope is found. This relationship, when combined with experimental observations of breaker travel, permits an estimate of the maximum breaking wave height a coastal structure might experience given a design wave period and design depth at the structure site. Breaker-type classification according to inshore and offshore parameters as presently defined cannot be reconciled to observations of the relationship between breaker-height index, wave steepness, and beach slope. Revised criteria for breaker classification are presented. (Woodard-USGS) W73-10975 W73-10975

CHARACTERISTICS OF WAVE RECORDS IN THE COASTAL ZONE,
Army Coastal Engineering Research Center,
Washington, D.C.
D. L. Harris.

CERC Reprint 2-73, 1973. 51 p, 19 fig, 6 tab, 28 ref. (reprint from Waves on Beaches and Resulting Sediment Transport: Academic Press, Inc., 1972.)

Descriptors: "Ocean waves, "Beach erosion, "Waves (Water), "Oceanography, Measurement, Methodology, Mathematical studies, Energy equation, Gages, Aerial photography, Correlation analysis, Shore protection, Coastal engineering, Design criteria.

Identifiers: Ocean wave gaging, Wave record analysis

Records from several types of ocean wave gages in coastal zones have been compared to obtained a measure of instrumental reliability. It is found that pressure records, as properly corrected, may give a better measure of surface waves, than some a better measure of surface waves, than some gages which record the surface elevation directly. An examination of the spectra computed from the records of a five-gage array of pressure gages at Pt. Mugu, California, provides evidence that the true spectra consist of a group of narrow spikes, not a smooth continuous function of frequency as often assumed. Data from Pt. Mugu and several east coast wave stations show that multinodal spectra are common in coastal locations. The frequency of maximum energy density in the pressure spectra is frequently different from that of the surface spectra or the velocity spectra. Photographs of waves from space are used to show that long crested waves with no more than slight variation in direction do occur in the ocean. Aerial photography of a coastal region is used to show that wave conditions can vary significantly within short distances in the coastal region. (Woodard-INGCS) USGS)

FREE-SURFACE IDEAL FLUID FLOWS BY FINITE ELEMENTS, Cornell Univ., Ithaca, N.Y. Dept. of Civil Engineering.
S. T. K. Chan, B. E. Larock, and L. R. Herrmann.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 99, No HY6, Paper
9787, p 959-974, June 1973. 6 fig, 20 ref, 3 append.
NSF Grant GK-4789.

Descriptors: *Open channel flow, *Finite element analysis, Computer programs, Hydraulics, Hydrodynamics, Identifiers: Free-surface flows.

The two-dimensional flow of an ideal fluid which emerges as a free surface jet from a containing vessel of arbitrary shape is studied. The finite element analysis of this problem seeks an approximate solution for the minimization of a functional which describes this problem. Gravity effects and curvilinear, solid boundary walls are easily taken into account. The method provides a rational analytical algorithm for adjusting free surface coordinates. The iterative technique used in conjunction with the algorithm requires the solution of a linear, symmetric, banded equation system during each iteration, which is quickly done Gaussian elimination. Results include not only free surface profiles but also velocity and pressure distribuprofiles but also velocity and pressure distribu-tions throughout the flow domain. Computational examples are given which required (1-20 iterations and used 3 min to 8 min of execution time on the IBM 7044 computer. (Knapp-USGS)

ACCELERATED MOTION OF A SPHEROID IN VISCOUS PLUID, Wisconsin Univ., Milwaukee. Dept. of Energetics. For primary bibliographic entry see Field 02J. W73-10989

COMPARISON OF BRIDGE BACKWATER RELATIONS, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 02E. For primary W73-10990

FRICTION FACTOR AND REYNOLDS NUMBER IN POROUS MEDIA FLOW, Asian Inst. of Tech., Bangkok (Thailand). Div. of Water Science and Engineering. For primary bibliographic entry see Field 02F. W73-10991

THE EFFECT OF SILTING ON FLOW PROFILE UPSTREAM OF WEIRS—A CASE STUDY, B. D. Suryavanshi. Irrigation and Power (India), Vol 29, No 4, p 429-437, October 1972. 4 fig, 1 tab, 7 ref.

Descriptors: *Reservoir silting, *Weirs, *Flow profiles, *Stage-discharge relations, Hydraulic models, Sedimentation. Identifiers: *India (Wainganga River).

The Dhuti weir is a diversion work across the Wainganga River in Balaghat district of Madhya Pradesh, India. To test the effects of silting behind the weir, a geometrically similar sectional model was constructed in a 0.915-m-wide flume to a scale

Field 08-ENGINEERING WORKS

Group 8B-Hydraulics

ratio of 1/24. Silting upstream of weirs decreases ratio of 1/24. Silting upstream of weirs decreases the depth of water over crest for the same discharge. This factor should be taken into account while using these structures for assessing the discharge in the rivers. Flooding upstream of weirs increases beyond the computed levels with original bed levels when accretion of silt takes place upstream. (Knapp-USGS) W73-16994

UPLIFT PRESSURE BELOW HORIZONTAL APRON WITH CUTOFF AT INTERMEDIATE POINTS, FOUNDED ON ANISOTROPIC PERVI-

POINTS, FOUNDED ON ANSOTROPIC PERVI-OUS MEDIUM OF FINITE DEPTH, Jodphur Univ. (India). B. C. Panmia, and S. C. Patwa. Irrigation and Power (India), Vol 29, No 4, p 391-406, October 1972. 18 fig, 3 tab, 9 ref.

Descriptors: *Seepage, *Uplift pressure, *Dam design, *Analog models, Groundwater movement, Soil water movement.

The effects of finite depth and anisotrophy of the soil medium on seepage under weir aprons, with cutoffs at various positions, were studied using analog models. Theoretical solutions were based analog models. Theoretical solutions were based on Pavlovsky's analysis, taking into account the anisotropy of the soil medium. The principal parameters investigated are the total base width of the apron; the widths of the apron upstream and downstream of the cutoff pile; the depth of the pile; the depth of porous medium; and the anisotropy ratio. (Knapp-USGS) W73-10995

FORMATION OF CAVITY IN CONFINED

AQUIFER, Indian Inst. of Tech., Kharagpur. Dept. of Agricul-

Indian Inst. of tech., Palanegon. Popular tural Engineering. A. P. Mishra, and B. Anjaneyulu. Irrigation and Power (India), Vol 28, No 3, p 241-244, July 1971. 3 fig, 8 ref.

Descriptors: *Water wells, *Aquifers, *Confined water, *Hydraulic models, Tubes, Dimensional analysis, Analytical techniques, Equations, Correlation analysis, Design criteria, Drawdown, Sande

Identifiers: *Cavity wells, Cavity formation, Pre-

A type of tube-wells kntiown as cavity wells which have no strainers is preferred by the farmers because of low cost of construction. These wells because of low cost of construction. These wells draw water through a cavity formed below the well pipe in a confined aquifer. The boring is carried out through the entire upper confining clay layer up to the underlying sand layer and pumping is started. At the beginning, large quanties of sand come out along with discharge, but after some time the discharge will be free from sand which signifies that a stable cavity has been developed. The cavity should be developed to the safe limit of bearing capacity of upper confining layer; but in actual well it is not possible to measure the size of cavity developed. Experiments were conducted on cavity developed. Experiments were conducted on the sand model of a tube-well in a confined aquifer to determine the shape and size of cavity forma-tion. An equation based on dimensional analysis was used to predict the size of cavity formed in an aquifer of particular thickness when the diameters of particles and working drawdown are known. A nomograph is presented to avoid mathematical computations. For all the materials the shape of the cavity was parabolic when the top surface was circular. (Woodard-USGS)

8C. Hydraulic Machinery

LOADING AND DESIGN OF TRANSMISSION Bureau of Reclamation, Denver, Colo.

H. Brenman.

Paper, ASCE Special Conference on Safety and Reliability of Metal Structures, Pittsburg, Pa., Nov 1972. 22 p, 6 fig. 5 ref.

Descriptors: *Transmission towers, Transmission lines, *Reliability, Erection, Structural design, Maintenance, Loads (Forces), Ice, Fabrication, Construction, Inspection, Snow, Wind pressure, Winds, Design criteria, Electric cables, Transmission (Electrical), Yield strength. Identifiers: Transmission line hardware, National Electrical Safety Code, Overloads.

Modern civilization is so intimately dependent on electrical energy that the need for continuous delivery is unquestioned. The reliability and strength of transmission towers play a major role in the uninterrupted delivery of power. Methods of ensuring reliability in transmission towers are discussed. Each tower must be designed to support the transmission conductors, insulators, and hardware under all conditions other than unforeseeable catastrophes if delivery of power is to be uninterrupted. Most transmission lines require at least 3, sometimes 6 or 7, different types of either suspension or tension towers. Two major factors influencing structural reliability of transmission lines are: (1) loads, and (2) tower design. Other elements discussed include tower fabrication, foundation design and construction, erection, and periodic inspection and maintenance. (USBR) W73-10616 W73-10616

THE CLUSTER LAYOUT—A NEW CONCEPT FOR PUMPER-STORAGE, Bechtel Corp., San Francisco, Calif.

J. G. Patrick. Water Power, Vol 24, No 9, p 339-345, Sept 1972.

Descriptors: *Pumped storage, Hydroelectric power, Pump turbines, Structures, *Underground powerplants, Underground structures, Structural design, Economics, Safety, Environmental ef-fects, Feasibility studies, Cost comparisons, Sub-mergence, Stress analysis. Identifiers: Underground cavities, Layout,

Increasing use of pumped storage projects has caused rapid development of reversible pump turbine units. Increase in unit size and unit head has been remarkable, and the design of these modern high-speed, high-head units requires deeper submergence of the pump turbine unit below minimum level of the lower reservoir than required for a turbine only. The pumped storage plant usually has been an adaptation of a conventional powerplant. Additional submergence and drawdown at the lower reservoir have created costly design problems when using conventional costly design problems when using conventional powerplant designs. A new concept for pumped storage plants—the cluster design—offers a better solution to design requirements than conventional arrangements. The cluster design is described; adarrangements. The cluster design is described, advantages in design, safety, operation, cost, and environment are enumerated. Stresses in the rock surrounding the underground cavity are substantially lower for cluster powerhouses than for conventional underground powerhouses. (USBR) W73-10618

HYDRAULIC JETTING, DRILLING TOOL AIDS DIRECTIONAL WORK, Continental Oil Co., New Orleans, La. R. E. McKee.

Oil and Gas Journal, Vol 69, No 12, p 146-148, March 22, 1971, 2 fig.

Descriptors: Drilling, Drilling fluids, "Hydraulic equipment, Hydraulic machinery, "Drilling equip-ment, Jets, Oil industry, Offshore platforms. Identifiers: Jetting, "Directional drilling, Drill bits,

A tool is discussed which adds to jet-deflecting efficiency for directional-hole surge pump, significantly increases instantaneous jet impact, bit horsepower, and nozzle velocity. A comparison test between jetting with surface pumps and the hydraulic jetting drilling tool showed a fourfold increase in bit horsepower with the rig using the hydraulic jetting drilling tool over the one without. The tool is operated by picking up the drill string until the bit is suspended a short distance off the bottom. At this time the tool is at its full extension and its fluid chamber is full. The string is then slacked off with the pumps on. At the instant the bit touches bottom, the string must be traveling at a rate sufficient to close the tool in .50 to .75 sec. After the bit reaches bottom, the drill string continues to move downward, forcing a stream of mud through the bit jets at a rate much greater than if the pumps were working alone. (Campbell-NWWA) W73-10717

WELL DRILLING IN SOUTHEAST ASIA, Camp, Dresser and McKee, Boston, Mass. For primary bibliographic entry see Field 08A.

AIR BLAST DRILLING WITH ROTARY ROCK BITS,

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BITS, Chicago Pneumatic Tool Co., Ill. J. B. Coulter, Jr. Water Well Journal, Vol 23, No 3, p 29-34, March,

Descriptors: Drilling, Rotary drilling, *Drilling equipment, Boreholes, Drilling fluids, Bearings, *Rock mechanics, Lubricants, Friction. Identifiers: *Air rotary drilling, Drill bits, Drilling nammeters Compressors

The most important part of air drilling is at the bottom of the hole where the air meets the cuttings. It is at this point that the success or failure of the application of air to rotary drilling is determined. Field data indicate that conventional flow or low pressure nozzles are more efficient than jet types nozzles for air drilling because there is less total effect at the bottom of the hole, expecially between the conces and the head section of the bit. A full opening or reduced full opening air course through the center of the head section to direct the air flow on top and part the cutter elements is recommended. Bearing lubrication is not a problem in air drilling, provided enough air volume flows through the bearings to prevent heat builproblem in air drilling, provided enough air volume flows through the bearings to prevent heat buildup. Drilling rates and total footage per bit are substantially greater when drilling with air as opposed to mud provided a sufficient volume of air is maintained to prevent chip recutting. A classification scheme for evaluation of dull bits is presented. (Campbell-NWWA) W73-10797

8D. Soil Mechanics

UPLIFT PRESSURE BELOW HORIZONTAL APRON WITH CUTOFF AT INTERMEDIATE POINTS, FOUNDED ON ANISOTROPIC PERVIOUS MEDIUM OF FINITE DEPTH, Jodphur Univ. (India).
For primary bibliographic entry see Field 08B.
W73-10995

8E. Rock Mechanics and Geology

A MODEL STUDY OF ROCK-JOINT DEFOR-MATION, Norwegian Geotechnical Inst., Oslo. Norwegian (Barton. Rock Mech Min Sci, Vol 9, No 5, p 579-602, Sept 1972. 15 fig, 8 tab, 23 ref.

Descriptors: "Joints (Geologic), "Fractures (Geologic), Model studies, "Faults (Geologic), Deformation, Rocks, Finite element analysis, Foreign research, Reviews, Rock mechanics, Rock properties, Engineering geology, Shear strength, Numerical analysis, Bibliographies. Identifiers: Norway, Residual strength, Horizon-

tal fractures.

Because of difficulties in numerically simulating jointed rock a widespread move toward physical modeling may contribute to obtaining better joint characteristics values. Existing rock-joint modeling techniques are reviewed. One physical modeling techniques are reviewed. One physical modeling method produces mating tension fractures in a weak, brittle model material using a large guilloine device. Parallel sets of model joints can be produced which are continuous, cross-jointed or offset. Direct shear properties of these 3 types are compared and evaluated. Recent numerical modeling of jointed rock masses has been based on assumed values of the shear and normal stiffness de least of shear and normal stiffness tests on the model joints are used to assess these quantities. Shear stiffness depends upon both normal stress and size. For a given normal stress, an inverse proportionality exists between test dimension and shear stiffness. Normal stiffness depends on the preconsolidation or virgin normal stress level. Problems of simulating behavior of jointed rock masses by the finite element method are reviewed. (USBR) W73-10607

AIR BLAST DRILLING WITH ROTARY ROCK

BITS, Chicago Pneumatic Tool Co., Ill. For primary bibliographic entry see Field 08C. W73-10797

SF. Concrete

D.

02.

IMPREGNATION OF CONCRETE PIPE. Southwest Research Inst., San Antonio, Tex. For primary bibliographic entry see Field 08G. W73-10419

FACTORIAL EXPERIMENTS IN CONCRETE

RESEARCH,
James Cook Univ. of North Queensland,
Townsville (Australia).

D. M. F. Orr. Journal of American Concrete Institute, Proceedings, Vol 69, No 10, p 619-624, Oct 1972. 2 fig, 9 tab, 5 ref.

Descriptors: Cements, Compressive strength, *Concretes, *Statistical methods, Temperature, *Concrete technology, Statistics, Methodology, Research and development, Foreign research,

Identifiers: Factor analysis, Cement content, Factorial experiments.

Single factor experiments conducted to investigate different responses of concrete could mask true effects because interactions among factors may occur. In such circumstances, using the factorial type of experiment is desirable. Further advantages of this technique are: (1) a check can be made on the precision of an experiment, and (2) errors can be identified. An example of the technique is presented, using cement temperature, initial mix temperature, cement composition, and water-cement ratio as factors. The anomaly in the analytical results was traced through calculations to the source—the testing laboratory. Significant interactions were found, indicating that conventional single factor experiments can mask true effects. Whenever interactions are suspected, the factorial technique should be used. (USBR) Single factor experiments conducted to investigate

SUGGESTED DESIGN AND CONSTRUCTION PROCEDURES FOR PIER FOUNDATIONS. American Concrete Inst., Detroit, Mich. Commit-tee 336.

Journal of American Concrete Institute, Proceedings, Vol 69, No 8, p 461-480, Aug 1972. 11 fig, 40 ref, append.

Descriptors: *Concrete construction, *Founda-tions, Excavation, *Structural design, Construc-tion materials, Earth pressure, Reinforced concrete, Quality control, Concretes, Deflection, Linings, *Inspection, *Piers, Soil mechanics, Bibliographies, Loads (Forces).

Bibliographies, Loads (Forces).

Suggested design and construction procedures are presented for foundation peirs 2 ft 6 in. in diameter, or larger, made with plain concrete or reinforced concrete. This report by ACI Committee 336 is limited to piers constructed by digging, drilling, or otherwise excavating holes in the soil, later filled with concrete, and does not include rectangular piers or spread footings in deep excavation. While structural design and construction is the primary topic, the influence of soil mechanics is also considered. Combined attention of designer and constructor is essential for the successful design and construction of pier foundations to establish the necessary interrelation with the surrounding and supporting soil or rock. Design of piers includes: (I) determining overall pier size, and (2) a detailed design procedure of the concrete pier. Emphasis is placed on item (1) involving interaction between soil and pier, with item (2) referenced to ACI 318-71 (Building Code Requirements for Reinforced Concrete) or ACI 322. Construction methods described include excavation, casing, and placement of concrete and steel. Recommended procedures for inspection and evaluation and criteria for acceptance are presented. (USBR)

THE SAN FERNANDO EARTHQUAKE: A LES-SON IN HIGHWAY AND BRIDGE DESIGN, California State Div. of Highways, Sacramento. For primary bibliographic entry see Field 08A. W73-10612.

A NEW MATERIAL TO CEMENT WELL CAS-ING, Cities Service, Co., Corpus Christi, Tex. D. L. Oliver, and F. T. Jones. Oil and Gas Journal, Vol 67, No 41, p 95-96, October 13, 1969. 1 tab.

Descriptors: Wells, Grouting, *Cement grouting, Well casing, *Drilling fluids, Logging (Recording), Oil industry, Sturries, Testing, Testing, procedures, Drilling equipment, Rotary drilling, *Materials testing, Concretes, Concrete placing,

On-site tests.
Identifiers: Cement bond logging, Drilling mud.

A new material allows drilling fluids to be used in preparing custom slurries for down-hole casing ce-ment. The mud-concrete product can be used in any water-based mud and will tolerate normal amounts of oil and diesel fuel in the mud. Two use-ful qualities of this slurry are: (a) the mud-concrete ful qualities of this slurry are: (a) the mud-concrete slurry does not contract when setting; and (b) the slurry is completely compatible with the drilling fluid system. Other advantages include: (1) except for low temperature slurries, the extended setting time of the mud cement at ambient temperatures will permit the optimum use of central mixing plants in active drilling areas; (2) reduced material requirements; (3) easy control of setting through use of retarders; (4) compressive strengths after 24 hr. generally above 500 psi, which is normally considered adequate; (5) easy control of slurry weight in pressure sensitive zones. Field test results on two differeent wells are given. (Campbell-NWWA)

8G. Materials

IMPREGNATION OF CONCRETE PIPE.
Southwest Research Inst., San Antonio, Tex.

Environmental Protection Agency, Water Pollu-tion Control Research Series, June 1971. 73 p. 14 fig. 4 tab, 22 ref. EPA Program 11024 EQE, Con-tract 14-12-835.

Descriptors: Concrete, *Concrete pipes, Corrosion, *Corrosion control, Protective coatings, *Sewers, Sulfur, Hydrogen sulfide, Resins. Identifiers: *Impregnation, *Hydrofluoric acid, Acid resistance, Bacterial action, Sulfate re-

Methods to increase the corrosion resistance, increase the strength, and reduce the permeability of concrete used in sewer line applications by impregnating the concrete pipe with relatively low cost resins such as asphalt, coal tars, linseed oil, sulfur, urea-formaldehyde, and others were investigated. The materials, techniques of application, test results and economics are presented. A large number of candidate impregnation materials were obtained and screened both in the laboratory and in limited field tests. Dilute hydrofluoric acid, sulfur and modified sulfur were found to impart the best corrosion resistance by impregnation. Other materials including vinyl-vinylidene chloride, vinyl acetate-acrylic, nitrile rubber latex, nitrile phenolic rubber, an emulsified reclaimed rubber and a rubber base adhesive, although faing to impregnate the concrete, formed surface coatings having exceptional corrosion resistance. (EPA) W73-10419

PRACTICAL INTERFERENCE CURRENT TESTING ON UNDERGROUND METALLIC STRUCTURES, Tennessee Gas Pipeline Co, Houston, Tex. R. L. Seifert.

Materials Protection and Performance, Vol 11, No 10, p 41-49. Oct 1972, 17 fig.

Descriptors: "Corrosion, "Corrosion control, "Pipelines, "Underground structures, Structures, Metals, Metal pipes, Electrodes, Electrolysis, Cathodic protection, Rectifiers. Cathodic protection systems, "Corrosion currents, "Stray current corrosion, Galvanic corrosion,

Step-by-step methods for handling stray current interference problems on underground metallic structures are presented. Stray currents of both static and dynamic characteristics are considered. Since interference problems are not encountered regularly prior to making interference tests, corrosion control personnel often must review the procedures. The literature is reviewed and a guide presented to aid both experienced and inexperienced corrosion control personnel. Specific interference problems ranging from simple categories to complex examples given in simple and concise terms may be adapted singularly or in combination to solve virtually every interference problem encountered. Pitfalls in establishing interference currents are discussed. (USBR)

SUGGESTED DESIGN AND CONSTRUCTION PROCEDURES FOR PIER FOUNDATIONS. American Concrete Inst., Detroit, Mich. Committee 336.

For primary bibliographic entry see Field 08F. W73-10611

FATIGUE OF STEEL WELDMENTS, Jones and Laughlin Steel Corp., Pittsburgh, Pa. B. Pollard, and R. J. Cover. Welding Journal, Vol 51, No 11, p 544s-554s, Nov 1972. 8 fig, 6 tab, 84 ref.

Field 08—ENGINEERING WORKS

Group 8G-Materials

Descriptors: "Welding, "Welded joints, "Fatigue tests, Stress, Stress relieving, Heat treatment, "Bibliographies, Metals. Identifiers: Weldments, Butt welds, "Welds, Electroslag welding, Filler welds, Arc welding, "Fatigue (Materials), Residual stress.

Literature on fatigue of steel weldments was reviewed and the effects on fatigue strength of reviewed and the effects on fatigue strength of testing conditions, weld geometry, weld metal aoundness, residual stress, and microstructure of the weld metal and heat-affected zone were examined. Weld geometry was shown as the most important factor in determining fatigue properties of a weld. For a given weld geometry, the fatigue strength is determined by the severity of the stress concentration at the weld toe or, with the weld reinforcement removed, by the stress concentration at weld metal defects. Different welding processes influence fatigues strength by producing ence fatigue strength by producing welds with different degrees of surface roughness and weld metal soundness. Residual stress caused and weld metal soundness. Residual stress caused by welding only affects fatigue strength for alter-nating loads. Under these conditions a moderate increase in fatigue strength is obtained by thermal stress relief. Larger increases in fatigue strength may be obtained by postweld treatments that produce compressive residual stresses, instead of the original tensile stresses, at the weld toe. The microstructures of the weld metal and heat-af-fected zone have only a minor effect upon the fected zone have only a minor effect upon the fatigue strength of welds and are usually masked by the much greater effects of weld geometry and weld defects. (USBR)

REINFORCED THERMOPLASTICS AND THERMOSETS FOR CORROSION CONTROL: STATE OF THE ART, Monsanto Co., St. Louis, Mo.

T. L. Tolbert, and T. B. Lewis.

Materials Protection and Performance, Vol 11, No 4, p 19-24, April, 1972. 3 fig, 4 tab, 27 ref.

Descriptors: Materials, Materials testing, *Plastic pipes, *Plastics, Corrosion, Corrosion control, Pipes, *Physical properties, Strength of materials, Stainless steel, Asbestos, Cost analysis. Identifiers: Fiberglass, *Thermopl

The remarkable growth rate in use of FRP (Fiberglass Reinforced Plastic) for corrosion resistant service—15 to 25% per year during most of the 1960's—is testimony both to the need for improved corrosion resistant materials and to the corrosion engineer's increasing acceptance of reinforced plastics as materials of construction. Properties of this material which makes it advantageous in various applications are (1) avactors. rroperues of this material which makes it advantageous in various applications are (1) superior corrosion resistance; (2) high strength and light weight; (3) low thermal and electrical conductivity; (4) ease of installation and little maintenance; (5) low installed cost. A high speed filament windng process coupled with an improved resin system has been used in fabrication of pipe to successfully bridge the cost barrier with steel; list prices for some sizes of vinyl-epoxy / glass pipe for oil field service have been reported to be below those of Schedule 40 (bare) steel. A comparison of FRP with other corrosion-resistant structural materials is given, along with properties of reinforcing agents used in FRP. (Smith-NWWA)

LESS TIME, FEWER HAZARDS WITH PEL-LETIZED ACID,

Universal Oil Products, St. Paul, Minn. Johnson

D. C. Schafer. ohnson Drillers' Journal, p 4-5, March-April 1971. 2 fig

Descriptors: Wells, *Water wells, *Well screens, Chemicals, Chemical reactions, Municipal water, Pumps, Pumping, *Acids, Wellpoints. Identifiers: *Rehabilitation (Wells), *Incrustation, Scaling, *Hydrochloric acid, Acid pellets.

For rehabilitation of incrusted water wells, acid pellets which dissolve readily once they fall to the bottom of a well save time and reduce the hazards of acid treatment. Use of these pellets makes it unnecessary to transport and handle dangerous liquid hydrochloric acid and eliminates the need for cumparate of the pellets of the pel hydrochloric acid and climinates the need for cum-bersome pipe or hose arrangements to conduct liquid acid into the well screen. Advantages of pel-litized acid over dry powdered acid are also given, mainly that less acid is needed in pellet form. The pump may be left in the well provided the space between pump and casing is large enough to allow the pellets to fall past the pump. Results are im-proved by agitation of the acid solution in the well; this can be done by starting and stopping the pump or by the use of a surge plunger. In order to force the solution out of the screen into the formation, it is recommended that a quantity of water equal to is recommended that a quantity of water equal to the volume in the screen be put into the well. After the volume in the screen be put into the well. Atter remaining for several hours or preferably over-night, the solution should be pumped to waste until the water is clean. Case histories of use in various municipal wells are given. (Smith-NWWA) W73-10709

WELL LEVEL MEASUREMENT METHODS,

Maguire (Charles A.) and Associates, Boston, R. H. Babcock

Journal New England Water Works Association, Vol 85, No 1, p 1-9, March, 1971. 3 fig.

Descriptors: Wells, Water wells, "Water level recorders, "Water level fluctuations, Water levels, Groundwater, Groundwater resources, Well spac-ing, Well data, "Observation wells. Identifiers: Water level records.

The measurement of well levels is essential for the The measurement of well levels is essential for the evaluation of both proposed and existing ground water supplies. 2 1/2-inch observation wells are commonly used for this purpose, and can be located both adjacent to the well under test and at some distance to permit plotting and drawdown curve, as well as observing the influence of pumping upon the water table. The discussion is limited to those level measurement methods which are mechanical and therefore can be considered to mechanical and, therefore, can be considered to have the highest degree of dependability for the conditions encountered. The most common technique, explained in detail, is the use of the bubble tube. Another arrangement, though not as well known as the common bubble tube, is the charged air bell method. The third class of devices for this service could be called hydropneumatic. Auxiliary devices for performing such functions as low water cutout or alarm, level or drawdown control, and level measurement transmission are described. (Campbell-NWWA) W73-10710

UNDERGROUND CORROSION AND SALT IN-FILTRATION

Connecticut Univ., Storrs, Dept. of Civil En-For primary bibliographic entry see Field 04C. W73-10712

FIND, HALT CORROSION IN WELL CASING NOW FOR SAVINGS IN THE FUTURE, Sun Oil Co., Tulsa, Okla.

Oil and Gas Journal, Vol 66, No 37, p 120-124, 127, September 9, 1968. 6 fig.

Descriptors: Corrosion, *Corrosion control, Logging (Recording), *Cathodic protection, *Well casing, Electrochemistry, Anodes, Bentonite, Re-sistivity, Pitting (Corrosion). Identifiers: Well logging, *Caliper logging, Ground

Costly workovers of wells due to leaks in the cas-ing caused by external corrosion have prompted much investigative work and many individual as

well as field-wide installations of cathodic protection systems. To obtain an idea of the extent of uon systems. I o o o o duan an uoea or tine extent or corrosion damage, the casing thickness logging tool is useful. Its signal undergoes a phase shift dependent on, among other things, the mass of metal surrounding the coils. This phase shift is recorded continuously on a chart at the surface as the tool is commonsy on a chart at the surface as the tool is pulled up the hole, giving a continuous indication of metal mass surrounding the coils. Available as an auxiliary tool which can be run simultaneously with the casing-thickness tool is the electronic inwith the casing-thickness tool is the electronic in-ternal caliper log. Using both logs simultaneously, it is possible to ascertain whether pitting is exter-nal or internal. Curves of logs showing what col-lars, pits, holes, general corrosion, lower weight joints, and tapers would look like on a graph are given. An overview of the process of cathodic pro-tection as applied to well casing is outlined. (Campbell-NWWA)

WELL LOGS: A BASIC DRILLING TOOL-4. USE DIAGENESIS TO SPOT FORMATION CHARACTERISTICS, Dresser Industries, Inc., Houston, Tex. Oilfield Products Div.

Oil and Gas Journal, Vol 70, No 3, p 97-101, January 17, 1972, 15 fig. 23 ref.

Descriptors: *Logging (Recording), *Electrical well logging, Radioactive well logging, Pressure, *Geologic investigations, Geologic units, Salinity, Resistivity, Limestones, Oil industry, Sandstones, Drilling, Gamma rays, Drilling fluids, *Diagenesis. Identifiers: Oil reservoirs, Nuclear well logging.

The use of principles of diagenesis, which includes compaction, cementation, recrystallization, and perhaps replacement, can show unconformities, faults, development of high pressure, communica-tion between zones, and permeable sand with a large areal extent. An unconformity will be marked by an abrupt decrease in diagenetic values; faults are characterized by a very abrupt change from a decreasing diagenetic value to an increasing one; a marked gradual increase in diagenetic values characterizes the onset of high pressures; and zones in communication with other zones will show a very sharp increase in diagenetic values. Apparent diagenetic-stress factors can be obtained from gamma-ray logs; the procedure is outlined. Zones of lost circulation can sometimes be noted on induction logs—they are characterized by abnormally high resistivities. The makeup water is much fresher than the formation water in the normal compaction depths. (Smith-NWWA)

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FUNDAMENTALS OF CATHODIC PROTEC-

TION, Mobil Research and Development Corp., Dallas, Tex. F. E. Blount.

In: Proceedings, University of Oklahoma Corrosion Control Course, September, 1970, p 17/1 - 17/10. 7 fig, 2 tab, 3 ref.

Descriptors: Corrosion, *Corrosion control, *Cathodic protection, Resistance, Oxidation-reduction potential, Electrolytes, Anodes, Cathodes, Metals, Ions, Ion transport, Ionization. Identifiers: *Polarization, *Electrical potential, Electromotive series, Stray currents.

Basic electrochemical principles necessary to the understanding of cathodic protection are discussed and explained; these principles are related to cathodic protection using and electrical analogy. The electron current flow concept (i. e., analogy. The electron current flow concept (t. e., current is considered to be flowing from anode to cathode) is used throughout the discussion. The four components of a corrosion circuit are described, and the nature of the driving force in a corrosion cell is discussed covering such topics as oxidation potentials, the zero potential, use of oxidation potentials to predict reactions, the electromotive series of metals, and the magnitude of potentials. Electrical analogies for cathodic protection mechanisms are given along with their limitations. The procedure of emf measurement between the structure to be protected and a reference electrode in order to determine whether the structure is being adequately protected is shown. (Campbell-NWWA)

HEAT FLOW AND PRECISION TEMPERA-TURE MEASUREMENTS IN BOREHOLES, Virginia Polytechnic Inst., Blacksburg. J. K. Costain, and P. M. Wright. In: Society of Professional Well Log Analysts 10th Annual Logging Symposium, p J1-J21, 1969. 6 fig, 27 ref.

Descriptors: *Boreholes, *Heat flow, *Utah, Thermal radiation, Geophysics, Temperature, Instrumentation, *Data collections, Heat transfer, Conductivity, Rock properties, the transfer, Identifiers: Thermal energy, gradient, Thermal conductivity.

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Heat flow measurements in boreholes might be a valuable supplementary exploration method in the future. Both the geothermal gradient and the rock thermal conductivity are necessary for a heat flow measurement. Comparison of the resistance of a platinum resistance probe with a primary standard resistance yields resistance measurements accurate in the field to about 0.003%. This value for a wrobe whose nominal ice-noint resistance is about rate in the field to about 0.003%. This value for a probe whose nominal ice-point resistance is about 1,000 ohms, is equivalent to an accuracy of plus or minus 0.01 degree C. However, other factors lower the absolute accuracy of temperature measurements to about plus or minus 0.05 degree C. The overall accuracy of heat flow measurements is probably 10% to 15%. A capstan hoist powered by a 2-he pelectric motor was used to raise a double armored cable out of the borehole. (Smith-NWWA) W73-10786.

LOWEST COST-PER-FOOT IS AIM OF OWN CALCULATIONS, D. Murphy.
Oil and Gas Journal, Vol 67, No 9, p 110-114, March 3, 1969. 8 fig, 2 ref.

Descriptors: Drilling, "Rotary drilling, "Optimiza-tion, Drilling equipment, Equations, Mathematical studies, Drilling fluids, Bearings, "Cost analysis. Identifiers: "Drilling parameters, Rotary speed, Bit weight, Drill bits, Drill testing.

Three basic equations are given to determine optimum bit weights and rotary speeds. They are those for instantaneous drilling rate, instantaneous rate of tooth dulling, and the equation used to determine rotating hours before bearings fail. The four point drilling test is made during the half-life of the bit run so that the drilling rate will reflect an average of M and gamma (weight parameter and rotary speed exponent) over the entire run. A drilling test should be performed in the following order: (1) start the test with maximum weight so that if bit balling is going to be a problem, it will be apparent early and a lower weight can be used; (2) going from one point to the next requires a change in weight or rotary speed—not both; (3) the only time weight must be drilled off is in going from point 2 to point 3 in the four point test, and this is point 2 to point 3 in the four point test, and this is drilled off at maximum operating conditions; (4) the test can be run in the shortest time, and changes in total tooth wear will be a minim (Campbell-NWWA) W73-10791

WELL STIMULATION—HOW ACIDS BEHAVE IN SOLUTION, Marathon Oil Co., Tex. For primary bibliographic entry see Field 08A.

W73-10792

SEISMOGRAPH AND RESISTIVITY USE IN SHALLOW GROUNDWATER SEARCH, Layne-Northwest Co., Milwaukee, Wis. Layne-Northwe J. P. O'Connor.

Journal of the American Water Works Associa-tion Vol 62, No 7, p 433-434, July, 1970. 2 fig.

Descriptors: Groundwater, "Geologic investiga-tions, Glacial aquifers, "Gravels, Shallow wells, Seismic waves, "Seismographs, Seismic proper-ties, Surveys, Exploration, "Subsurface water availability, Resistivity, Zone of saturation. Identifiers: Subsurface data, Lithology.

As the search for groundwater becomes more and more intensified, the need for fast, dependable aids to exploration becomes greater. A seismic instrument for use in ground water exploration utilizes a cathode ray tube to record seismic waves. The unit consists of the instrument itself, in 6 volt wet cell battery, a geophone, and a manually operated hammer or tamper used to create shock energy. Different methods of setting up the device, using different "spreads" or lines of shock initiation are given. Test drilling many 'single spread' depth determinations to water table and bedrock have shown, in most instances, an accuracy of plus or minus 10 per cent. The seismograph provides accurate information on the thickness of saturated material underlying the areas of interest, information which is used to determine areas worthy of further geophysical exploration with the earth resistivity instrument. The seismograph also useful in determining the type of bedrock, employing the principle that sound will travel at differing rates in materials of differing densities (i.e., differing lithologies). (Campbell-NWWA) W73-10793

INVESTIGATION OF USE OF GEL MATERIAL FOR MINE SEALING, Dravo Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 05G. W73-10880

81. Fisheries Engineering

THE DISCOVERY OF BOTHRIOCEPHALUS GOWKONGENSIS YEH. IN THE BASIN OF KHARKOV REGION, (IN RUSSIAN), Kharkov State Univ. (USSR).
N. N. Shevchenko, and L. K. Belinisova.
Vestn Zool. Vol 6, No 2, p 78-79, 1972. English

Identifiers: *Bothriocephalus-Gowkongensis, *Cyprinus-Carpio, *Kharkov basin, Records, USSR.

In 1967 B. gowkongensis was found for the first time in fingerlings of Cyprinus carpio L. from the ponds of the Limanian fishery farm (the Kharkov region). Apparently it was brought into Lake of the Krasnodar region.—Copyright 1973, Biological Abstracts, Inc.

THE ELEMENTS OF ENERGY BALANCE IN GRASS CARP (CTENOPHARYNGODON IDEL-LA VAL.): IL FISH FED WITH ANIMAL FOOD, Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.

Z. Fischer.

Pol Arch Hydrobiol. Vol 19, No 1, p 65-82, 1972.

Identifiers: Animal food, *Carp (Grass), Ctenopharyngodon-Idella, Energy balance, *Fish food.

Comparison of energy budgets of grass carp fed with exlusively plant and exclusively animal food

was made. Grass carp bred under laboratory conditions is omnivorous. Its growth rate is smaller when fed with exclusively plant food than with animal food. (See also W72-13815)—Copyright 1973, Biological Abstracts, Inc.

STUDIES ON THE CARP CULTURE IN RUNNING WATER POND: V. OXYGEN SUPPLY AND CONSUMPTION IN THE FISH POND AND ESTIMATION OF THE AMOUNT OF HARVESTABLE FISH IN A POND, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo

(Japan). For primary bibliographic entry see Field 02I. W73-10815

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER AND RELATED LAND RESOURCES TRAINING NEEDS STUDY, COMPREHENSIVE PLANNING FOR WATER AND RELATED LAND RESOURCES IN ALABAMA, Auburn Univ., Ala. Center for Urban and Regional Planning.

Planning.
S. P. Snow.
Available from the National Technical Information Service as PB-213 562, \$3.00 in paper copy, \$0.95 in microfiche. Alabama Development Office, Montgomery, Report No. ALA-AU-X996-WRC-72-3, February, 1972. 86 p, 6 append. WRP-71-1

Descriptors: *Water resources planning, *Training, Education, *Alabama, Land use, *Manage-

It is difficult to obtain reliable and useful informa-tion concerning training needs for Alabama agen-cies involved in water resource and related land use programs. This situation is due in part to a general lack of understanding of what is involved in the over-all view of water resources and related in the over-all view of water resources and related land use planning, what role each agency plays in the process, and possibly a gap between what these agencies are doing and what needs to be done. In-house training is often dictated by the agency's purpose and function and closely linked with the degree of knowledge, training and background of its personnel. There is no one agency with knowledge of what is being offered on the continuing education level to meet training needs in Alabama. Additional formal courses and special programs especially at senior and graduate school in Alabama. Additional formal courses and special programs especially at senior and graduate school levels are needed. A centralized training agency to initiate and co-ordinate an interagency and public education program with initial emphasis on pollution control, resource planning, water quality maintenance and improvement, and on water resource planning should be established. Appendices include an extensive catalog of available courses, sources of financial support and addresses of educational institutions. (Elfers-North Carolina) W73-10695

9B. Education (In-House)

WATER AND RELATED LAND RESOURCES TRAINING NEEDS STUDY, COMPREHENSIVE PLANNING FOR WATER AND RELATED LAND RESOURCES IN ALABAMA, Auburn Univ., Ala. Center for Urban and Regional

Planning. For primary bibliographic entry see Field 09A. W73-10695

Field 10-SCIENTIFIC AND TECHNICAL INFORMATION

Group 10A-Acquisition And Processing

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

CONCEPTUAL SYSTEM DESIGN FOR AN EN-VIRONMENTAL INFORMATION BASE FOR MANAGEMENT OF WATER AND RELATED RESOURCES BY STATES, Banks (Harvey O.), Inc., Belmont, Calif. O. Banks, and G. T. Orlob. Available form the National Technical Informa-tion Service as PB-221 124, 34.85 in paper copy, 30.95 in microfiche. Completion Report, March 1973, 78 p, 2 fig, 4 append. OWRR X-114 (No. 3424) (1).

Descriptors: "State governments, "Management, "Decision-making, "Environment, "Natural resources, "Electronic Data Processing, "Data Storage and Retrieval, "Information Retrieval, Data collections, Systems design, Computers, Data Transmisson, Water resources, Land resources, Geographical Regions, Hydrologic

Identifiers: Information Base, User-oriented,

Research was undertaken to evaluate the pres Research was undertaken to evaluate the present resource information management activities of the states as related to state functions, and to develop a concept for planning and designing a comprehensive state or regional information management system. Sound environmental resource development and management is increasingly a state responsibility, requiring availability of a comprehensive information base for evaluating alternatives. Incompatibility between state secrey, and prehensive information base for evaluating alternatives. Incompatibility between state agency, and between state and federal agency data files, documented by questionnaires and field surveys, limits the accessibility of relevant information to resource managers. A state-level Environmental Resources Information Management System was conceptualized, supported by an Environmental Information Base incorporating the organized and systemized aggregation of resource information available from all resource agencies. Conceptual format and guidelines for the Information Base includes identification of Resource Subjects related to state agency functions, and a systemized cludes identification of Resource Subjects related to state agency functions, and a systemized methodology for classifying and indexing data types and parameters. Institutional arrangements for implementing the concepts were formulated. Tables include results from state surveys, and charts show the structure of the Information Management System and Information Base. The methodology would enable a state to develop and implement an Information Base that would provide compatible, accessible information on a timely basis for resource management by all agencies. ly basis for resource management by all agencies. W73-10725

HYDROLOGY AS A SCIENCE, Arizona Univ., Tucson. Dept. of Hydrology and

M. J. Dvoracek, and D. D. Evans. M.J. Dvoracek, and D. D. Evans.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 19-29 (1972), 2 figs, 1 tab, 4

Descriptors: *Hydrology, *Education, *Systems analysis, Southwest U.S., Arid lands, Water analysis, Southwest U.S., Arid lands, Water balance, Hydrologic cycle, Oceanography, Meteorology, Geology, Biology, Glaciology, Geomorphology, Soils, Hydrologic properties, Water resources development, Water utilization, Water requirements, Surface waters, Ground-water, Water importing, Effluents, Water manage-ment (Applied), Water law, Economic impact, Legal aspects, Political aspects, Social aspects, Ecology, Environmental effects, Water users.

Ecology, Environmental effects, Water users.

Experimental and historical development of the systematic study of water is briefly reviewed to prove hydrology a science. The Hydrology program at the University of Arizona is outlined, and details of the course 'water and the environment' are expounded. This introductory course is intended for non-scientific oriented students at this southwestern university. A reading list is provided for the class, and scientifically designed laboratory experiments are developed. The first semester includes discussion of world water inventory; occurrence of water; hydrologic cycle; initeraction of oceanography, meteorology, geology, biology, glaciology, geomorphology and soils; properties of water (physical, biological, chemical), and resources development. The second semester discusses municipal, industrial and agricultural water requirements, surface, ground, imported and effluent water resources management; water resource planning; ecological impact; patterns of use; and survival of man. Mathematical problems are reviewed along with ecological orientation of students. (See also W73-10818) (Popkin-Arizona) W73-10820

WATER-TEMPERATURE DATA ACQUISITION WATER-TEMPERATURE DATA ACQUISITION ACTIVITIES IN THE UNITED STATES, Geological Survey, Washington, D.C. Office of Water Data Coordination. For primary bibliographic entry see Field 07C. W73-10986

10C. Secondary Publication **And Distribution**

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME Office of Water Resources Research, Washington,

For primary bibliographic entry see Field 05B. W73-10556

OIL SPILLAGE, A BIBLIOGRAPHY, VOLUME Office of Water Resources Research, Washington,

D.C. For primary bibliographic entry see Field 05B. W73-10557

FATIGUE OF STEEL WELDMENTS, Jones and Laughlin Steel Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 08G. W73-10617

COST ANALYSIS OF WATER POLLUTION CONTROL: AN ANNOTATED BIBLIOGRAPHY, Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring, For primary bibliographic entry see Field 05G. W73-10879

PESTICIDE-SEDIMENT-WATER INTERAC. TIONS, Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research ary bibliographic entry see Field 05B.

BIBLIOGRAPHY ON THE ECOLOGY AND TAXONOMY OF MARINE ALGAE, California Univ., San Diego, La Jolla. Inst. of Marine Resources. For primary bibliographic entry see Field 05C. W73-10949

10D. Specialized Information **Center Services**

DESIGN AND PILOT STUDY OF AN ARIZONA WATER INFORMATION SYSTEM, Arizona Univ., Tucson. Office of Arid Lands Stu24

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dies.
K. E. Foster, and J. D. Johnson.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 2, Proceedings of the 1972 meetings of the Arizona Section, American Water Resources Assn., and the Hydrology Section, Arizona Academy of Science, May 5-6, 1972, Prescott, Arizona, p 43-52, (1972). 2 fig, 9 ref.

Descriptors: "Hydrologic data, "Information retrieval, "Water, "Design data, "Arizona, Hydrologic systems, Groundwater, Rainfall-ru-noff relationships, Water levels, Water quality, Water utilization, Water demand, Arid lands, Data storage and retrieval.

Water information systems may have different demands, such as responding to queries about rainfall-runoff relationships, water level data, water quality data and water use. Data required for retrieval may need display, such as a hydrograph. Information systems are reviewed and results of specific water information agencies are reported. Agencies in Arizona are listed with their specific water information need. Development of a water activity file and water information system is outlined for Arizona as a pilot project. Linkage of units within the data system is shown, as is the information system's questionnaire to project leaders. Information currently in the system in cludes water quality from the State Department of Health for 450 wells in the Tucson Basin, and water level, storage, storage coefficient and transmissivity supplied by the Arizona Water Commission for the Tucson Basin and Avra Valley, Quality of data submitted to the system should be reflected in retrieval for better understanding of the data. This consideration is planned for the coming fiscal year. (See also W73-10818) (Popkin-Arizona)

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- ► Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- ► Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- ▶ Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- ▶ Water resources economics at the Water Resources Center of the University of Wisconsin.
- ▶ Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- ▶ Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- ▶ Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- ▶ Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- ▶ Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- ► Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- ► Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- ▶ Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- ▶ Water treatment plant waste pollution control at American Water Works Association.
- ► Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

- NATURE OF WATER
- WATER CYCLE

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